"To employ each of nature's products in the most favorable way possible": nature as a commodity in eighteenth-century German economic discourse

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"To employ each of Nature's products in the most favorable way possible" – Nature as a Commodity in Eighteenth-Century German Economic Discourse

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Abstract: In German territories in the eighteenth century a large number of texts propagated an intensified exploitation of natural resources. This discourse comprised programmatic statements as well as seemingly "neutral" descriptions of corresponding technological processes. For a broad range of addressees, the exploitation of natural resources was thus legitimized as desirable for the well-being ("Glückseligkeit") of the individual and the state. The contribution explains the emergence of this discourse by factors ranging from contemporary economic thought over the establishment of economic societies to the dissemination of new media like the rapidly spreading journal culture. In summarizing it is argued that if man, as has often been argued, in its actions has always been taking on a utilitarian attitude towards nature, it is in the eighteenth century that this attitude was first broadly disseminated in written discourse – a development that, obviously, can not be labeled an anthropological constant and thus deserves further investigation by environmental historians.

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Introduction

With its long-term modernization processes, eighteenth-century Europe plays a prominent role in the historical sciences. Environmental historians have identified two decisive turning points in that period for their discipline as well. The first concerns energy consumption, namely the transition from renewable to fossil fuels, which first took place in England;[1] the second, the growing industrialization process, which brought with it environmental problems on an unprecedented scale. Local pollution grew from a regional issue to a national, and finally to a global one.[2] But apart from these two aspects, the eighteenth century has attracted little attention among environmental historians. Joachim Radkau remarked more in passing in his global history of the environment: "The characteristic feature of that time of most far-reaching consequence was the ubiquitous urge to make optimal use of nature's every last resource."[3] Moreover, in the political and economic literature, the category "nature" became "a strategic element in promoting economic growth."[4] Did the eighteenth century set developments in motion that were only to bear fruit during the industrialization of the nineteenth century? Did the attitudes towards nature that authors of this period propagated turn out to be prerequisite conditioning for industrialized society? Radkau's argument referred back to a number of studies by Günter Bayerl, in which the decades following 1750 in the German territories were characterized by a new "subjugation of nature to economy" (*Ökonomisierung der Natur*).[5] The present essay seeks to underpin Bayerl's argument with an analysis of practice-oriented eighteenth-century sources disseminating this utilitarian view of nature's products or wealth among decision-makers in administration, agriculture, and the crafts and trades.

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1 See Rolf Peter Sieferle, The Subterranean Forest: Energy Systems and the Industrial Revolution (Cambridge 2001).

2 See Günter Bayerl, "Das Umweltproblem und seine Wahrnehmung in der Geschichte," Mensch und Umwelt in der Geschichte, Jörg Calliess, Jörn Rüsen, and Manfred Striegnitz (eds.) (Pfaffenweiler, 1989), pp. 47-95.

3 Joachim Radkau, *Natur und Macht. Eine Weltgeschichte der Umwelt* (Munich, 2002), p. 227.

4 Radkau (cf. note 4), p. 227 resp. 234. About the relevance of the period between 1700 and 1850 see also Wolfram Siemann, *Vom Staatenbund zum Nationalstaat. Deutschland 1806-1871*, (Munich, 1995), pp. 131-134.

5 See, for example, Günter Bayerl, "Der Zugriff auf das Naturreich: Technologie im 18. Jahrhundert," *Technologie zwischen Fortschritt und Tradition. Beiträge zum internationalen Johann-Beckmann-Symposium Göttingen 1989*; Hans-Peter Müller and Ulrich Troitzsch (eds.), (Frankfurt/Main etc., 1992), pp. 81-94; Günter Bayerl, "Prolegomenon der ‚Großen Industrie'. Der technisch-ökonomische Blick auf die Natur im 18. Jahrhundert," *Umweltgeschichte. Umweltverträgliches Wirtschaften in historischer Perspektive*, Werner Abelshauser (ed.), (Göttingen, 1994), pp. 29–56; Günter Bayerl, "Die Natur als Warenhaus. Der technisch-ökonomische Blick auf die Natur in der Frühen Neuzeit," *Umwelt-Geschichte. Arbeitsfelder – Forschungsansätze – Perspektiven*, Reinhold Reith and Sylvia Hahn (eds.), (Vienna and Munich, 2001), pp. 33-52.

The main features of Bayerl's argument, that the *Ökonomisierung der Natur* in the eighteenth century marked a decisive turning point in man's relationship toward nature, is briefly sketched as follows: the "perception of nature as a commodity" (*technisch-ökonomischer Blick auf das Naturreich*)[6] was systematically adopted to dismantle such natural constraints on economic growth as the food-shortage crises typical of the early modern period. In order to increase production both in quantity and quality of vegetable and animal materials, cameralistic policy intensified exploration of natural resources within the reform-absolutist state's own territory. Its stock-taking of the resources from the three kingdoms of nature mostly concerned the animals and plants. Minerals only played a minor role in this context: they belonged, with mining, to a separate realm of knowledge. According to Bayerl, a specific characteristic of the 'commodification' of nature is that it predated the emergence of industrialization processes of special relevance to environmental history: chemical pulping of raw materials (which replaced older techniques of mechanical pulping),[7] and the use of fossil fuels, which latter led to the transition to a new energy basis for the economy. The concerns of nature commodified remained agrarian products of vegetable and animal origin that served not only as foodstuffs, but also as raw materials for the various crafts. Finally, with its emphasis on agriculture and animal husbandry, the *Ökonomisierung der Natur* necessarily implied changes to the cultural landscape, marking the beginnings of a landscape conditioned by the demands of the crafts and manufactures.

With its focus on man's interaction with the raw materials of nature, Bayerl's argument of the eighteenth-century *Ökonomisierung der Natur* allows a systematic integration of results from different historical disciplines. Increased woodland management as a crucial resource of the early modern economy, for example, has been explored recently in a number of regional case studies.[8] To

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[6] Bayerl's concept *technisch-ökonomischer Blick auf das Naturreich* translates more figuratively as: viewing nature with the trained eye of an accountant or surveyor. It is perhaps best reflected in the word "commodity," with its French etymological sense of convenience.

[7] See Christoph Meinel, "Reine und angewandte Chemie. Die Entstehung einer neuen Wissenschaftskonzeption in der Chemie der Aufklärung," *Berichte zur Wissenschaftsgeschichte* 8 (1985), pp. 25-45.

[8] See the recent references in Nils Freytag and Wolfgang Piereth "Städtische Holzversorgung im 18. und 19. Jahrhundert – Dimensionen und Perspektiven eines Forschungsfeldes," *Städtische Holzversorgung. Machtpolitik, Armenfürsorge und Umweltkonflikte in Bayern und Österreich (1750-1850)*, Wolfram Siemann, Nils Freytag and Wolfgang Piereth (eds.) (Munich, 2002), pp. 1-8 and, in particular, Joachim Radkau, "Das 'hölzerne Zeitalter' und der deutsche Sonderweg in der Forsttechnik," *"Nützliche Künste." Kultur- und Sozialgeschichte der Technik im 18. Jahrhundert*, Ulrich Troitzsch (ed.) (Cottbuser Studien zur Geschichte von Technik, Arbeit und Umwelt, no. 13), (Münster, 1999), pp. 97-117 and Winfried Schenk, "Forest Development Types in Central Germany in Pre-Industrial Times. A Contribution by Historical Geography to the Solution of A Forest History Research Argument about the 'Wood Scarcity' in the 18th Century," *L'uomo e la foresta secc. XIII-XVIII*, Simonetta Cavaciocchi (ed.) (Prato, 1996), pp. 202-223.

what extent the heated debates and conflicts over access to the products of the forest might be generalized to other natural resources has yet to be adequately investigated, however. Contemporary efforts to augment food production, on the other hand, are studied in agrarian history as well as in the history of economic theories. Much attention by social historians as well as economists has, of course, been devoted to the attempts toward agrarian reform in the eighteenth and nineteenth centuries.[9] What has not been taken into account, is that in the eighteenth century these developments were part of a much broader survey of nature's resources, finding expression in the 'commodification' of nature. What is more, if one widens the focus to the early modern period as a whole, Bayerl's argument can be effectively extended beyond history of the environment to recent approaches in the history of science, analyzing the emergence of a new kind of knowledge about natural resources in the context of the European expansion since the sixteenth century. They have stressed that the investigation of the extra-European flora and fauna was not only indebted to individual scientific curiosity but also to new institutional frameworks like the early modern academies, and by state initiatives, which comprehended the financing of research expeditions as well as the founding of royal botanical gardens.[10] Already at this early stage, the leading colonial powers tried to cultivate vegetable matter as raw materials for the crafts and trades either in their colonies or, where possible, at home in Europe. The *Ökonomisierung der Natur* defines a new stage in this development, which in the eighteenth century focused on the exploitation of domestic natural resources in Europe itself. In addition, dissemination of knowledge gained growing importance – a utilitarian attitude towards nature was considered a virtue in society as a whole. In the context of the Enlightenment's "instructive zeal" (*Belehrungswut*),[11] the perception of

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[9] See Walter Achilles, *Deutsche Agrargeschichte im Zeitalter der Reformen und der Industrialisierung* (Stuttgart, 1993), pp. 37-40 and Toni Pierenkemper (ed.), *Landwirtschaft und industrielle Entwicklung. Zur ökonomischen Bedeutung von Bauernbefreiung, Agrarreform und Agrarrevolution* (Stuttgart, 1989). On England see Mark Overton, *Agricultural Revolution in England. The Transformation of the Agrarian Economy 1500-1850* (Cambridge, 1996).

[10] See, for example, Emma C. Spary, *Utopia's Garden. French Natural History from Old Regime to Revolution* (Chicago and London, 2000), esp. pp. 99-154, Richard Drayton, *Nature's Government. Science, Imperial Britain, and the 'Improvement' of the World* (New Haven and London, 2000); Pamela H. Smith and Paula Findlen (eds.), *Merchants & Marvels. Commerce, Science, and Art in Early Modern Europe* (New York and London, 2002); Lisbet Koerner, *Linnaeus: Nature and Nation* (Cambridge/Mass. and London, 1999); Steffan Müller-Wille, "Nature as a Marketplace. The Political Economy of Linnaean Botany," *Oeconomies in the age of Newton*, Neil De Marchi and Margaret Schabas (eds.) (History of Political Economy; annual supplement vol. 34) (Durham, 2004), pp. 155-173.

[11] See Anne Conrad, Arno Herzig and Franklin Kopitzsch (eds.), *Das Volk im Visier der Aufklärung. Studien zur Popularisierung der Aufklärung im späten 18. Jahrhundert* (Veröffentlichungen des Hamburger Arbeitskreises für Regionalgeschichte; vol. 1) (Hamburg, 1998).

nature as a ware or commodity was conveyed to broader strata of the population using new media and institutions.

Objections to Bayerl's argument of the *Ökonomisierung der Natur* were mostly raised in passing, primarily doubting whether the commodification of nature had a direct influence on eighteenth-century economic practice. Joachim Radkau himself some years ago asked whether "humans had not always pursued a utilitarian approach towards nature" – implicitly doubting that the subjugation of nature to economy in the eighteenth century represented a turning point in the history of the environment.[12] Rainer Beck, who recently commented on Bayerl's argument in more detail, also claimed with respect to the pre-industrial agrarian economy not to be able to detect a "completely new 'perception of nature'" in the *Ökonomisierung der Natur*.[13] According to Beck, even though the distinction between benefits and losses, as an inherent part of all agrarian systems, was extended to all branches of the economy towards the end of the eighteenth century, it did not have immediate repercussions on the practice. This issue addressed by Radkau and Beck, namely the practical effects of the subjugation of nature to economy in eighteenth-century economic practice, is doubtless of central importance and remains to be researched in detail. We doubt, however, that it makes sense to measure the validity of Bayerl's argument solely on the question of whether such an economization of nature found immediate application within a matter of years or decades. This presupposes a simple cause-and-effect relationship at the level of words and deeds, which hardly does justice to the complex interaction between these levels in historical processes. Taking the issue of practical effectiveness as the sole yardstick also ignores to what extent the subjugation of nature to economy might – at least at the textual level – be labeled a turning point in the history of the environment. If it is true that the texts analysed here, which primarily addressed contemporary decision-makers but were also more widely accessible, explicitly propagated a utilitarian attitude towards nature's goods for the first time, this is of crucial relevance because this perspective on nature clearly gained increased importance in the modern period. It could hence turn out that the exploitation of natural resources as a characteristic of the industrialized world was deeply rooted in the *Ökonomisierung der Natur* as a new conditioning process of eighteenth-century society.

In our opinion, the few discussions of the *Ökonomisierung der Natur* did not fairly evaluate its historiographic relevance. The above-mentioned methodological objections should be answered with a much more careful separation be-

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[12] Joachim Radkau, "Technik- und Umweltgeschichte, Teil III," *Geschichte in Wissenschaft und Unterricht* 50(1999), pp. 356-384, there p. 360; similarly, more recently Michael Toyka-Seid, "Mensch und Umwelt in der Geschichte. Neues aus dem produktiven Selbstfindungsprozess der Umweltgeschichte," *Archiv für Sozialgeschichte* 43 (2003), pp. 423-447, there p. 426.

[13] Rainer Beck, *Ebersberg oder das Ende der Wildnis. Eine Landschaftsgeschichte* (Munich, 2003), p. 130.

tween, on the one hand, environmentally relevant actions, and on the other, contemporary remarks about the relationship between man and nature. Concentrating on the latter level, in this essay, we shall explore the broad dissemination of the perception of nature as a commodity in practice-oriented texts and try to locate this process within its historical context. In a first step, we discuss general considerations about our methodological approach: a pragmatic variant of discourse analysis, investigating historical discourses not as an independent entity but as inseparably embedded within the contexts in which they emerged. These methodological remarks seem particularly necessary since environmental historians – in contrast to a number of other historical disciplines – thus far have not made much use of analysis of discourses on the environment. The second part examines how the utilitarian approach to natural resources was propagated in cameralistic textbooks directed to governmental administrators. The third part deals with the dissemination of this discourse in media more strongly oriented towards implementation, namely academic prize contests and periodicals. As an extensive presentation of source material is not possible here due to the limited space, the section on cameralistic textbooks will primarily discuss the distinction between "useful" versus "harmful" animals. The section on prize contests and journals will focus on the attempts to increase local production of vegetable raw materials. This division is only motivated by heuristic reasons and should not be regarded as representative of the kinds of sources discussed. Finally, it must be emphasized that our focus in this context lies solely on the German-speaking territories. A cursory glance at the situations in England, France or Sweden reveals that very similar processes were happening there at the same time or even earlier.[14] German contemporaries in any case stressed the exemplary character of the foreign literature.[15] According to one mid-eighteenth-century commentary, it was a time "when most European empires were competing to improve agriculture, and even Germany was flooded with literature on husbandry."[16] This European dimension of the *Ökonomisierung der Natur* awaits more detailed study.

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[14] See, for example, Simon Schaffer, "The Earth's Fertility as a Social Fact in Early Modern Britain," *Nature and Society in Historical Context*, Mikulas Teich, Roy Porter, and Bo Gustafsson (eds.) (Cambridge, 1997), pp. 124-147 or Nicholas Goddard, "Agricultural Literature and Societies," *The Agrarian History of England and Wales*, Joan Thirsk (ed.), vol. VI 1750-1850 (Cambridge, 1989), pp. 361-383; on France see, for example, Philippe Steiner, "Les revues économiques de langue française au XVIIIème siècle (1751-1776)," *Les revues d'économie en France. Genèse et actualité 1751-1994*, Luc Marco (ed.) (Paris, 1996), p. 33-77.

[15] Johann Bergius was criticized in a review of his *Cameralistenbibliothek* for neglecting literature from these countries, even though "the laws and institutions of these countries often had become the reason and the basis for German laws and institutions." *Göttingische Anzeigen von gelehrten Sachen* 1763, no. 1, p. 7.

[16] Göttingische Anzeigen von gelehrten Sachen 1765, no. 32, p. 257.

Methodological approach

Methodological aspects of reconstructing historical perceptions of nature have not been discussed much by environmental historians. This is also true as regards the eighteenth century. Some well-known works in the tradition of the history of ideas, investigating the notion of "nature" in philosophical, theological, and scientific texts,[17] have failed to make clear in what way this literature was related to the thoughts of broader segments of the population, let alone concrete environmental problems in the Middle Ages and the early modern period.[18] This is also true of two often cited arguments, which identify new claims to human domination over nature in the medieval spread of Christianity (Lynn White, Jr.),[19] or in the works of Francis Bacon respectively.[20] Criticizing such approaches of a "detached history of ideas"[21] in our opinion should not, however, end in abandoning attempts to investigate discourses of man's relationship to nature in former times as such.[22] The skepticism towards how repre-

[17] Most extensive is Clarence J. Glacken, *Traces on the Rhodian Shore. Nature and Culture in Western Thought from Ancient Times to the End of the Eighteenth Century* (Berkeley and Los Angeles, 1967); furthermore Lothar Schäfer and Elisabeth Ströker (eds.): *Naturauffassungen in Philosophie, Wissenschaft, Technik*, Vol. II: *Renaissance und frühe Neuzeit* (Freiburg and Munich, 1994) and Vol. III: *Aufklärung und späte Neuzeit*, (Freiburg and Munich 1995); Karen Gloy, *Das Verständnis der Natur*, 2 vols. (Munich, 1995 and 1996) and id. (ed.), *Natur- und Technikbegriffe. Historische und systematische Aspekte: von der Antike bis zur ökologischen Krise, von der Physik bis zur Ästhetik* (Bonn, 1996); Roy Porter, *Enlightenment. Britain and the Creation of the Modern World* (London, 2000), pp. 295-319.

[18] For a similar criticism see Radkau (cf. note 4), p. 12.

[19] See Lynn White. Jr., "The historical roots of our ecological crisis," *Science* 155 (1967), pp. 1203-1207. For critical remarks on this argument see Joachim Radkau, "Wald- und Wasserzeiten, oder: Der Mensch als Makroparasit? Epochen und Handlungsimpulse einer humanen Umweltgeschichte," *Mensch und Umwelt in der Geschichte*, Jörg Calliess, Jörn Rüsen and Meinfried Striegnitz (eds.) (Pfaffenweiler, 1989), pp. 139-174, there pp. 139-140 and Rolf Peter Sieferle "Perspektiven einer historischen Umweltforschung," *Fortschritte der Naturzerstörung*, id. (ed.) (Frankfurt/Main, 1988), pp. 307-368, there pp. 356-360.

[20] See, for example, Carolyn Merchant: *The Death of Nature. Women, Ecology, and the Scientific Revolution* (San Francisco, 1990). For a more differentiated view on Bacon's works, see Lothar Schäfer, *Das Bacon-Projekt. Von der Erkenntnis, Nutzung und Schonung der Natur* (Frankfurt/Main, 1993); See also Peter Pesic, "Wrestling with Proteus. Francis Bacon and the 'Torture' of Nature," *Isis* 90 (1999), pp. 81-94.

[21] Joachim Radkau "Unausdiskutiertes in der Umweltgeschichte," *Was ist Gesellschaftsgeschichte*, Manfred Hettling (ed.) (Munich, 1991), pp. 44-57, there p. 48. Along a similar line, McNeill recently evaluated more positively the works analyzing "mid-level generalizations that concern the impact of specific ideas or sets of ideas": J. R. McNeill, "Observations on the nature and culture of environmental history" *History and Theory, Theme Issue* 42 (2003), pp. 5-43, there p.8.

[22] Besides these critical remarks, Sieferle recommended leaving the level of the "great authors" to investigate the major ideological motifs ("ideologische Großmuster") or "symbolic fields" forming part of the process of modernization. Our considerations in the following go in a similar direction. As will become clear, however, the thought figure of

sentative thought patterns (*Denkfiguren*) and texts in philosophy and theology were, which only reached a minority of members of early modern societies, should rather stimulate us to draw other kinds of sources into view that were more closely related to concrete interactions between humans and nature. To take up this issue with regard to the eighteenth century is advisable considering that historians do not even agree about whether or not the European process of industrialization involved any kind of rupture in the human relationship toward the environment.[23] This open question should thus serve as sufficient impetus for further research on this issue.

The methodological approach of discourse analysis,[24] in our view, is especially suited toward investigating how the relationship between man and nature was dealt with in written sources.[25] This means understanding statements con-

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oeconomia naturae, chosen by Sieferle for his study was not, in our opinion, representative of broadly disseminated eighteenth-century discourses. We rather follow the main strains of thought concerning the perception of nature ("Hauptlinien der Naturauffassung") in this period identified by Günter Bayerl. See Rolf Peter Sieferle, *Die Krise der menschlichen Natur. Zur Geschichte eines Konzeptes* (Frankfurt/Main, 1989), pp. 9-14 and Günter Bayerl, (cf. note 6, *Prolegomenon*) there p. 54. For another approach in this vein which analyzes legal norms in rural contexts, see Gerhard Jaritz and Verena Winiwarter, "On the perception of Nature in a Renaissance society," Teich et al. (cf. note 15), pp. 91-111.

[23] To name an example of two such diverging opinions Gilhaus stressed in her case study on environmental pollution in Westphalia with regard to the early modern, pre-industrial economy: "One was aware of the natural limitations and resulting dependency on them and tried to 'accommodate' oneself within these natural limitations ... Since the underlying conditions of life cannot be enhanced at will, the framing conditions of the economy developed according to the limitations imposed by nature." On the other hand, Wengenroth's survey of the relationship of industry and the environment concluded that, from an economic point of view, there is no difference between the interactions with nature in industrial and preindustrial contexts: "A change in attitude in dealing with nature that might be held responsible for aggravated environmental problems is not identifiable beyond a doubt." Today as in the past, it was the consumer's time horizon, the question of whether the exhaustion of certain resources would happen within one's own lifetime, which determined one's approach toward natural resources. See Ulrike Gilhaus, *"Schmerzenkinder der Industrie". Umweltverschmutzung, Umweltpolitik und sozialer Protest im Industriezeitalter in Westfalen 1845-1914* (Forschungen zur Regionalgeschichte, no. 12), (Paderborn, 1995), p. 49 and Ulrich Wengenroth, "Das Verhältnis von Industrie und Umwelt seit der Industrialisierung," *Industrie und Umwelt*, Hans Pohl (ed.) (Zeitschrift für Unternehmensgeschichte, suppl. no. 69), pp. 25-44, there p. 32.
By contrast to this, the argument of the "'50s syndrome" ("50er-Jahre-Syndrom") identifies a decisive turning point only in the middle of the twentieth century. About the problems of periodization in the history of the environment, see the recent paper by Toyka-Seid (cf. note 13), there pp. 425-427.

[24] See Achim Landwehr, *Geschichte des Sagbaren. Einführung in die historische Diskursanalyse* (Tübingen, 2001) and Philipp Sarasin, "Geschichtswissenschaft und Diskursanalyse," *Geschichtswissenschaft und Diskursanalyse*, id. (Frankfurt/Main, 2003), pp. 10-60. For a similar methodological debate see Olaf Asbach, "Von der Geschichte politischer Ideen zur ‚History of Political Discourse'?," *Zeitschrift für Politikwissenschaft* 12 (2002), pp. 637-666.

[25] On the necessity to distinguish these levels, see also Rolf Peter Sieferle, "Einleitung: Naturerfahrung und Naturkonstruktion," *Natur-Bilder. Wahrnehmungen von Natur und*

cerning this relationship as historical products in their own terms. They are then more generally comprehensible as part of a distinctive historical process during which the relationship between man and nature became increasingly "verbalized" in written discourse. Such an analysis thus carefully distinguishes human interactions with the environment from the production of discourses on the topic. Such a distinction is a prerequisite to investigating the dynamic interaction between these levels – or their irrelation. This does not mean, however, analyzing the textual sources devoid of their historical contexts. As will become clear in the second and third parts of this essay, reasons for the increased occurrence of utilitarian statements on nature's goods can be singled out on various levels: Shortages in agricultural production played their part just as did contemporary economic theories, institutional developments just as the establishment of new media.

The first step in such a discourse analysis seeks out the notions and concepts employed in former times to communicate on subjects that today are considered as relevant in the history of the environment. It is well known that the modern notion of the "environment" did not have an equivalent and that, on the contrary, the concept of "nature" had been employed since antiquity in an infinite number of contexts so that it evades conclusive definition.[26] However, the methodological consequences of these insights have yet to be drawn. For example, as already remarked, reflections on the notion of "nature" in medieval and early modern texts too often are labeled as relevant to contemporary attitudes towards the environment without further reflections on the validity of establishing such connections.[27] The following investigation of eighteenth-century sources consequently does not focus on the notion of "nature" in the first place. Our interest is rather to explore how the use of nature's commodities was taken up as an issue in written discourse in these times. Strictly speaking, we limit ourselves to the issue of the employment of natural resources in agriculture and the crafts. This topic, as already briefly pointed out, was treated in a number of different texts without any conceptual coherence. The notion of "nature," for example, in the context of commoditable nature hardly played any role. It has to be stressed in this regard that the perception of nature as a ware operated on a completely different level than the concept of *oeconomia naturae*. This concept, of considerable importance in eighteenth-century physico-theological literature just as in texts on natural history, has been identified

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Umwelt in der Geschichte, Helga Breuninger, Rolf Peter Sieferle (eds.) (Frankfurt/Main and New York, 1999), pp. 9-18.

[26] See, for example, A.J. Close, "Commonplace theories of art and nature in classical antiquity and in the Renaissance," *Journal of the History of Ideas* 30 (1969), pp. 467-486, and Robert Spaemann, "Genetisches zum Naturbegriff des 18. Jahrhunderts," *Archiv für Begriffsgeschichte* 11 (1967), pp. 59-74.

[27] A general uneasiness with the role of the notion of "nature" in environmental history is formulated in Joachim Radkau, "The Wordy Worship of Nature and the Tacit Feeling for Nature in the History of German Forestry," Teich et al. (cf. note 15), pp. 228-239.

as the most important expression of the eighteenth-century attitude towards the environment. This judgment was based on the premise of exploring to what extent the contemporaries were able to imagine a "totally man-made crisis of nature."[28] From this point of view, the importance of the notion of *oeconomia naturae* was that it excluded the possibility of a fundamental man-made crisis of nature as well as the exhaustion of particular natural resources. From our perspective, however, which does not ask for perceptions of environmental crises but for broadly disseminated strains of thought concerning a utilitarian use of natural resources, a completely different picture emerges: The more the eighteenth-century texts on vegetable and animal materials we investigated were aimed at a broader reading public, the more seldom was the notion of *oeconomia naturae* employed. In contemporary periodicals, the *oeconomia naturae* was discussed nearly exclusively in the context of comments on Linnaeus's writings. The much more frequent utilitarian statements on natural resources nearly completely ignored such comprehensive thought patterns and rather appeared in the more factual tone sketched above.

The concepts of *Ökonomisierung der Natur* and commodification of nature (*der technisch-ökonomische Blick auf das Naturreich*), as formulated by Bayerl, for us are thus pragmatic tools to delineate the realm of our analysis. Bearing in mind that eighteenth-century contemporaries themselves did not have these concepts at their disposal, they summarized statements concerning these topics much more simply – "in terms of potatoes, flax and paper."[29] Not grouped around particular keywords, the self-evident, factual character of the commoditable nature is often not instantly identifiable in eighteenth-century sources. There is far less clamor about it than, for example, about early modern debates on mining, which, in the fourteenth and fifteenth centuries, explicitly questioned the legitimacy of intrusions into the realm of "mother earth."[30] Francis Bacon's metaphors under controversial discussion among modern scholars, describing the conquest of nature by man as a consequence of Nature's unwillingness to give away her secrets, with reference to medieval female images of Nature personified,[31] are in this respect much more striking as well. On the contrary, the practice-oriented eighteenth-century texts discussed here started out from the tacit assumption that transgressing existing barriers to the use of nature's commodities was legitimate. The more directly such texts addressed decision-makers like state officials or landowners able to put into practice

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[28] See Sieferle (cf. note 23), pp. 9-34; Udo Krolzik, *Säkularisierung der Natur. Providenitia-Dei-Lehre und Naturverständnis der Frühaufklärung* (Neukirchen-Vluyn, 1988), pp. 132ff; Donald Worster, *Nature's Economy. A History of Ecological Ideas* (Cambridge, 1985[2]), pp. 26-55.

[29] Summary in a review of the 1742 volume of the *Leipziger Sammlungen*, *Göttingische Zeitungen von gelehrten Sachen* 1743, no. 11, pp. 93-95, there p. 95.

[30] See Bayerl (cf. note 3) there pp. 59-74.

[31] See Mechthild Modersohn, *Natura als Göttin im Mittelalter. Ikonographische Studien zu Darstellungen der personifizierten Natur* (Berlin, 1997).

intensified exploitation of nature's resources, the less explicit are the interpretations of the notion of nature and the more matter-of-factual is the argument.

Commoditable Nature in cameralistic literature

The emergence of the perception of nature as a commodity in the eighteenth century can be interpreted as an answer to recurrent supply crises typical of preindustrial societies. Famines persisted in the German territories from 1739-41, after the seven years' war (1756-63), and again from 1770-72 due to crop failure.[32] The population growth in the second half of the eighteenth century imposed additional demands on the provisioning of staple foods. The "agrarian movement" that emerged with a flurry of reference publications before 1800 drew successes, if only to a limited degree, in more intensive as well as extensive use of the soil. Changes in the social structure of the agrarian system lagged behind.[33] Reform-minded individuals often referred admiringly to the situation in England, where the agrarian system was experiencing radical changes and where, in certain regions, a considerable rise in productivity had already been achieved. New economic and political theories since the middle of the eighteenth century reevaluated the constant threat of famine, and the pressure on state administrations to take up reforms grew. The institutionalization of cameralism came in the late 1720s with the appointment of professorial chairs at universities. They provided the training of civil servants in administering the increasingly complex economic interests of the early modern state. Latest by the end of the seven years' war, cameralistic science increasingly adopted a political dimension as well under the leadership of the prominent cameralist of the time, Johann Heinrich Gottlob von Justi.[34] In this context, the

[32] See Christoph Dipper, *Deutsche Geschichte 1648-1789* (Frankfurt/Main, 1989); Günter Vogler, *Absolutistische Herrschaft und ständische Gesellschaft* (Stuttgart, 1996); Rainer Gömmel, *Die Entwicklung der Wirtschaft im Zeitalter des Merkantilismus 1620-1800* (Enzyklopädie Deutscher Geschichte, Vol. 46) (Munich, 1998).

[33] Hans-Ulrich Wehler, *Deutsche Gesellschaftsgeschichte*, Vol. 1: *Vom Feudalismus des Alten Reiches bis zur Defensiven Modernisierung der Reformära 1700 bis 1815* (Munich, 1989[2]), pp. 71-90; concerning a regional example, see Wolfgang Neugebauer, *Zentralprovinz im Absolutismus. Brandenburg im 17. und 18. Jahrhundert* (Berlin, 2001), pp. 172-180.

[34] See Horst Dreitzel, "Justis Beitrag zur Politisierung der deutschen Aufklärung," *Aufklärung als Politisierung – Politisierung der Aufklärung*, Hans Erich Bödeker and Ulrich Herrmann (eds.) (Hamburg, 1987), pp. 158-177. On its implementation see also Herbert Matis, "Die Rolle der Landwirtschaft im Merkantilsystem – Produktionsstruktur und gesellschaftliche Verhältnisse im Agrarbereich," *Von der Glückseligkeit des Staates. Staat, Wirtschaft und Gesellschaft in Österreich im Zeitalter des aufgeklärten Absolutismus*, id. (ed.) (Berlin 1981), pp. 269-293 and Franz A. J. Szabo, *Kaunitz and Enlightened Absolutism 1753-1780* (Cambridge, 1994), pp. 155-180.

emerging theory of cameralism,[35] whose major aim lay in the optimal management of natural and human resources, became of major relevance for the emergence of the perception of nature as a commodity as well. Thanks to a new, macroeconomic perspective on the domestic market, the *Ökonomisierung der Natur* gained its specific quality.

The authors of the earliest cameralistic texts of the late seventeenth century saw knowledge about endemic natural resources as a central prerequisite for promotion of the arts and crafts by the state.[36] For contrary to mercantile theory, domestic demand was not understood in the cameralistic literature as a zero-sum game and was hence of relevance to the desired increase in the sovereign's revenues. In this context, the natural wealth of a territory was assessed in the light of an active trade balance – the export of raw materials thus was to be avoided whenever possible. Having hitherto only been considered in the context of concrete measures from the middle of the eighteenth century, a territory's natural wealth gained a new programmatic meaning regarding its surveyal and use in cameralistic texts. In the wake of the economically disastrous seven years' war, the cameralists began to question the mercantile dogma of trade as the main source of a territory's wealth. In its stead came the insight that production was of most economic importance. This shift in theory was closely linked to the state goal of population growth (*Peuplierung*) and the novel worldly concept of the 'common weal' (*Glückseligkeit*) then propagated in the cameralistic literature.[37] Among other things, this concept opened opportunities for consumption to all hard-working citizens – the former early modern concept of consumption that was inseparably linked to a person's social station, began to lose its grip.[38] Under the dominant economic theory of autarky the authors saw a rise in productivity in the manufacturing arts as indispensable. These developments have been thoroughly researched, but only seldom was the necessary provision of raw materials taken into consideration. In the cameralistic literature any planned establishment of a new craft was inseparably linked to the local supply of raw materials. High transportation costs made accessibility of raw materials the determining factor in the locality as well as the profitability of large-scale production. Towards the end of the eighteenth century cameralists expanded their perspective to incorporate the whole production process

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[35] See Keith Tribe, *Governing Economy. The Reformation of German Economic Discourse 1750-1840* (Cambridge, 1988); Erhard Dittrich, *Die deutschen und österreichischen Kameralisten* (Darmstadt, 1974), pp. 56ff.; Marcus Sandl, *Ökonomie des Raumes. Der kameralwissenschaftliche Entwurf der Staatswirtschaft im 18. Jahrhundert* (Cologne, etc., 1999).

[36] See J. J. Becher, *Politischer Discurs ...* (Frankfurt/Main 1668).

[37] See Ulrich Engelhardt, "Zum Begriff der Glückseligkeit in der kameralistischen Staatslehre des 18. Jahrhunderts (J.H.G. v. Justi)," *Zeitschrift für Historische Forschung* 8 (1981), pp. 37-79.

[38] See Torsten Meyer, "Zwischen sozialer Restriktion und ökonomischer Notwendigkeit. 'Konsum' in ökonomischen Texten der Frühen Neuzeit," *Luxus und Konsum. Eine historische Annäherung*, id. and Reinhold Reith (eds.) (Cottbuser Studien zur Geschichte von Technik, Arbeit und Umwelt, no. 21) (Münster, etc., 2003), pp. 61-82.

beyond the supply of raw materials to the refining and processing of the final product.[39] In this context, the perception of nature as a commodity appears as a preventative measure against the apparently rising risks to the future common weal.[40] In this context, cameralism set its sights on surpassing natural limitations on existing modes of production. The *Ökonomisierung der Natur* was supposed to help minimize these risks and was thus, at least implicitly, raised to one of the state's aims.

With its macroeconomic focus, the subjugation of nature to economy in cameralistic texts attained a new quality against the older tradition of agricultural treatises, which since Antiquity had offered landowners better soil exploitation methods, for instance. This husbandry literature (*Hausväterliteratur*)[41] since the sixteenth century in the German territories contained quite similar proposals for increased productivity in agriculture and stock-breeding but retained a microeconomic focus. Consequently, it did not promote economic growth in the sense of the later cameralistic literature, which fostered raw material sources for the handicrafts in addition to food production. Nevertheless, the cameralists' territorial focus can already be discerned in the emerging early modern territorial sovereignty in three contexts: First, *Policey*-regulations since the sixteenth century in local or regional contexts aimed at securing the supply of raw materials – mainly the crucial resource timber. These regulations were mainly motivated, however, by the need to redefine customary rights in favor of the sovereign's own interests.[42] Second, the granting of countless privileges for inventions of efficient wood furnaces fostered better fuel use at the technological level.[43] Third, some sovereigns tried early on to survey the stock of raw materials in their territories. One example is Julius Duke of Braunschweig-Wolfenbüttel whose main interest lay in the minerals – ranging from building

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[39] Towards the end of the eighteenth century, the latter aspects were systematically explored by the new discipline "technology." See Bayerl (cf. note 6, *Technologie*); a fundamental study of these sources is still Ulrich Troitzsch, *Ansätze technologischen Denkens bei den Kameralisten des 17. und 18. Jahrhunderts* (Berlin, 1966).

[40] See Torsten Meyer, *Natur, Technik und Wirtschaftswachstum im 18. Jahrhundert* (Cottbuser Studien zur Geschichte von Technik, Arbeit und Umwelt, no. 12) (Münster, etc., 1999).

[41] See Werner Trossbach, "Das ‚Ganze Haus' – Basiskategorie für das Verständnis der ländlichen Gesellschaft in der frühen Neuzeit?," *Blätter für deutsche Landesgeschichte* 129 (1993), pp. 277-314; Stefan Weiss, "Otto Brunner und das Ganze Haus oder: Die zwei Arten der Wirtschaftsgeschichte," *Historische Zeitschrift* 273 (2001), pp. 335-369; Jörn Sieglerschmidt, "Die virtuelle Landschaft der Hausväterliteratur," Sieferle and Breuninger (cf. note 26), pp. 223-254.

[42] See Joachim Radkau, "Zur angeblichen Energiekrise des 18. Jahrhunderts: Revisionistische Betrachtungen der 'Holznot'," *VSWG* 73 (1986), pp. 1-37. For a case study, see Peter Kissling, "Policey der Nachhaltigkeit. Die Politik entdeckt die knappen Ressourcen," *Gute Policey als Politik im 16. Jahrhundert*, Peter Blickle, Peter Kissling and Heinrich Richard Schmidt (eds.) (Frankfurt/Main, 2003), pp. 515-547.

[43] See Rolf Jürgen Gleitsmann, "Erfinderprivilegien auf holzsparende Technologien im 16. und frühen 17. Jahrhundert," *Technikgeschichte* 51 (1985), pp. 217-232.

materials to salt and coal – in his territory.[44] Such examples represent the beginnings of a systematic administration of nature's commodities which, in the eighteenth century, were taken up and conceptually developed in the context of cameralistic theory. The following section briefly outlines how, in this context, cameralistic theory rather disposed of the notion of "nature" as such. At the same time, training handbooks for cameralists addressed the flora and fauna solely under the aspect of their utility in the manufacturing arts – thus creating a marked contrast to the literature on natural history with scientific pretensions.

The concept of "nature" in cameralistic literature

In their considerations on the relevance of nature's wares, the cameralists – similar to the physiocrats and the English "Classical School" – employed since the middle of the eighteenth century the conceptual dichotomy of "nature" vs. "art" which since Greek antiquity was a basic theme in all realms of knowledge. While in the middle of the eighteenth century cameralists still stressed the fundamental relevance of nature's productivity, towards the end of the century the emerging discipline of "technology" (*Technologie*) held a quite different view reflecting its interest in the manufacturing arts and crafts. Natural resources were increasingly regarded solely and rather parenthetically as "materials."

Leaving aside the differences between French, German and English literature on economic issues,[45] towards the middle of the eighteenth century all agreed that nature's products alone were the source of every kind of wealth.[46] The authors relied on thought motifs about "nature" linking back to the Aristotelian bias of matter and form.[47] This meant that only nature was capable of

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[44] See Hans-Joachim Kraschewski, *Wirtschaftpolitik im deutschen Territorialstaat des 16. Jahrhunderts. Herzog Julius von Braunschweig-Wolfenbüttel (1528-1589)* (Cologne and Vienna, 1978), pp. 126-138.

[45] See the article by Francois Quesnay: "Fermiers," *Encyclopédie, ou Dictionnaire Raisonné des Sciences, des Arts et de Métiers* ..., Denis Diderot and Jean Le Rond d'Alembert (eds.), Vol. 6 (Paris, 1756), pp. 528–540; id., "Analyse de la Formule arithmétique du Tableau Économique," *Physiocratie, ou Constitution Naturelle du Gouvernement* ..., Pierre Samuel Dupont (de Nemours) (ed.) (Paris, 1768, first: 1756), pp. 43–98; Richard Cantillon, *The Analyses of Trade, Commerce, Coin, Bullion, Banks and Foreign Exchanges ... Taken chiefly from a Manuscript of a very ingenious Gentleman deceas'd, and adapted to the present Situation of our Trade and Commerce by Phillip Cantillon*, (London, 1759) (first: Essay sur la nature du commerce en général, Paris 1755); Johann Heinrich Gottlob von Justi, *Der Grundriß einer Guten Regierung in Fünf Büchern*, (Frankfurt/Main and Leipzig, 1759).

[46] See Cantillon, Analyses of Trade (cf. note 46), p. 1. Justi, Grundriß (cf. note 46), p. 87 f. Quesnay, Tableau Économique (cf. note 46), p. 45.

[47] See Claus von Bormann et al., entry: "Form und Materie (Stoff)," *Historisches Wörterbuch der Philosophie*, Joachim Ritter (ed.), Vol. 2 (Darmstadt, 1972), cols. 977–1030, there cols. 979 ff.

producing matter, whereas man could only realize what nature herself would realize under different circumstances.[48] The validity of this concept for the cameralists can be deduced from their view that nature alone could generate "wares" which were merely transformed by human labor into "works of art" (*Kunstwaaren*).[49] It is striking that in cameralistic writing towards the end of the eighteenth century this categorical distinction became diluted. Some authors still claimed that the arts and crafts were only responsible for reshaping the "wares" of nature. Others, by contrast, classified the arts and crafts as a "productive class" (*producirende Klasse*). They thus underlined man's role in the production process and encouraged a theoretical relativization of natural productivity.[50] The core problem in this redefinition was, whether the form of certain products could be subject to human will at all. It seems that, in the context of enlightened thought, this insecurity in some way had to be solved. The introductory text by the economist Johann Beckmann from Göttingen *Anleitung zur Technologie*, first published in 1777, represents such an attempt.[51] In § 9, Beckmann explained: "The raw or already partly treated natural goods, which are used in the handicrafts, are called *materials*. *Secondary materials* are those, which serve as aids in the finishing process... *Goods* are the different products of the handicrafts."[52] While, on the one hand, Beckmann emphasised in the Aristotelian tradition that only nature generated "products" and that they were turned into goods by means of the labor applied,[53] on the other hand, he also called the same goods "different kinds of products."[54] Such emphasis on productivity as a result of human effort was only possible because Beckmann

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[48] Hans Blumenberg, "'Nachahmung der Natur'. Zur Vorgeschichte der Idee des schöpferischen Menschen," *Studium Generale* 10 (1957), pp. 266–283, there p. 274.

[49] Johann C. Förster, *Entwurf der Land= Stadt= und Staatswirthschaft* (Berlin, 1782), p. 197; Georg Friedrich von Lamprecht, Entwurf einer *Encyklopädie und Methodologie der ökonomisch=politischen und Cameralwissenschaften zum Gebrauch academischer Vorlesungen* (Halle, 1785), p. 197.

[50] See, for example, Bernhard Sebastian Nau, *Erste Linien der Kameralwissenschaft* (Frankfurt/Main, 1791), pp. 1f.; Carl Heinrich Thalitzer, "Erste Abhandlung. Ueber Industrie und Manufacturen," *Vier kurze Abhandlungen*, id. (Kopenhagen and Hamburg, 1785), pp. 3–21.

[51] See Manfred Beckert, *Johann Beckmann* (Leipzig, 1983). On his achievements and later impact see Günter Bayerl and Jürgen Beckmann (eds.), *Johann Beckmann (1739–1811). Beiträge zu Leben, Werk und Wirken des Begründers der Allgemeinen Technologie* (Cottbuser Studien zur Geschichte von Technik, Arbeit und Umwelt, no. 9) (Münster, etc., 1999).

[52] "*Materialien* nennet man die rohen, oder schon zum Theil bearbeiteten Naturalien, welche Handwerke verarbeiten. *Nebenmaterialien* heissen solche, die bei der Verarbeitung, als Hülfsmittel dienen... *Waaren* sind die verschiedenen Producte der Handwerke." Johann Beckmann, *Anleitung zur Technologie oder zur Kenntniß der Handwerke, Fabriken und Manufacturen, vornehmlich derer, die mit der Landwirthschaft, Polizey und Cameralwissenschaften in nächster Verbindung stehen. Nebst Beyträgen zur Kunstgeschichte* (Göttingen, 1777), p. 11.

[53] Ibid. Preface, unpaginated.

[54] "die verschiedenen Producte," ibid. p. 11.

had reevaluated nature's wares for the purposes of technological reflection,[55] – namely as materials. Similar to the English "Classical School", which unconsciously expulsed nature from economic discourse, Beckmanns "Technologie" also spurred on the formal emancipation of handicraft production from nature.

The example sketched in this chapter shows that cameralistic texts discussed "nature" as an independent category only in a very specific way. The questioning of traditional thought figures described above was situated rather at the level of philosophical discourse. This discussion therefore hardly provides a clue toward understanding how the cameralists wanted the human relationship toward nature to be perceived in more practice-oriented contexts. This issue can only be addressed by consulting other kinds of texts more closely related to contemporary economic practice.

Natural history in cameralistic practice – of useful and harmful animals

Among the texts addressing eighteenth-century decision-makers on economic issues, textbooks of natural history had the oldest tradition. Natural history in general was concerned with the classification and description of the plants and animals. These efforts were not restricted to the endemic flora and fauna. Species encountered outside Europe increasingly came into focus as well. Of special interest in our context is a branch of this literature addressed to a broader reading public during the second half of the eighteenth century. In the context of this popularization process, the question of whether such foreign plants could be grown in Europe as well and the search for endemic plants with similar characteristics became increasingly important. In this genre, possibilities to exploit vegetable and animal materials for human purposes had always played an important role. Eighteenth century natural history thus followed the much older utilitarian paradigm of this genre, even though it reappeared in slightly altered form.

Until the late seventeenth century, natural history continued to adhere in several respects to its ancient traditions. Authors often just compiled older works, presenting an educated lay readership with contents matching the early modern concept of "curiosities."[56] The genre lacked a standard structural order. The flora and fauna presented, for example, could be arranged alphabetically, by their usefulness, or by the four seasons. The relevance of natural goods to the well-being of human-kind continued to have a prominent position in these

[55] Wolfhard Weber, "Die ‚Anleitung zur Technologie' von Johann Beckmann," Müller and Troitzsch (cf. note 6), pp. 3–16, there p. 16.

[56] See Neil Kenny, *"Curiosity" in Early Modern Europe. Word Histories* (Wolfenbüttel, 1998).

texts. It was nevertheless subordinated to the predominant impetus of moral education.[57] A reorientation of this discourse can be discerned towards the end of the seventeenth century, when the emerging "classical" natural history became completely devoted to taxonomic efforts.[58] The great variety of ordering structures was gradually replaced by a nomenclature successfully established especially with regard to the flora. At the same time, moralizing passages disappeared as well as explicit statements on the utility of nature's goods and on the general use of natural history as a discipline. In the internal debates of eighteenth-century natural history regarding classification and hence the degrees of kinship of different species, such issues did not have much relevance anymore. However, if natural history was to gain recognition as a scientific discipline[59] its relevance for society had to be formulated in some way. Authors felt obliged to issue programmatic statements at least in the introductions to their works.[60] The French naturalist George Louis DuHamel DuMonceau stated: "In addition to the pleasure of knowing where common materials originally come from, similarity (analogy) can help us to discover, in our own country, … plants of similar qualities. So this unique and particular taste … leading to analogy … can be very useful to society. I am quite sure that in the forests of Cayenne the Quinqvina might be found, and perhaps even such trees which supply a varnish resembling that from China."[61] The seemingly purely scientific value of methodological reasoning thus became interlocked with criteria of social relevance. With such strategies, naturalists tried to consolidate the posi-

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[57] See Udo Friedrich, *Naturgeschichte zwischen artes liberales und frühneuzeitlicher Wissenschaft. Conrad Gessners "Historia animalium" und ihre volkssprachliche Rezeption* (Tübingen, 1995).

[58] See Michel Foucault, *Die Ordnung der Dinge* (Frankfurt/Main, 1989[8]), p. 165; Ludwig Trepl, *Geschichte der Ökologie vom 17. Jahrhundert bis zur Gegenwart* (Weinheim, 1994[2]), p. 64; Anette Diekmann, *Klassifikation – System – 'scala naturae'. Das Ordnen der Objekte in Naturwissenschaft und Pharmazie zwischen 1700 und 1850* (Stuttgart, 1992); Frank William Peter Dougherty, *Gesammelte Aufsätze zu Themen der klassischen Periode der Naturgeschichte. Collected Essays on Themes from the Classical Period of Natural History* (Göttingen, 1996).

[59] See Herbert Hans Egglmaier, *Naturgeschichte. Wissenschaft und Lehrfach. Eine Beitrag zur Geschichte des naturhistorischen Unterrichts in Österreich* (Graz, 1988).

[60] See Torsten Meyer, (cf. note 41) p. 72.

[61] "Ausser dem Vergnügen, das man hat, zu wissen, woher die gebräuchliche Materialien kommen, kan uns die Aenlichkeit (Analogie) zu Entdeckung von Pflanzen in unsern eigenem Land, ... bringen, die die nemliche Eigenschaft haben. Dann dieser eigene und besondere Geschmack ... der zur Aenlichkeit füret ... kan der Gesellschaft sehr nützlich werden. Ich glaube ganz gewis, daß man in den Wäldern von Cayenne die Quinqvina, und vielleicht auch solche Bäume antreffen würde, die einem, dem Chinesischen gleichkommenden Firnis geben." George Louis DuHamel DuMonceau, *Natur=Geschichte der Bäume darin von der Zergliederung der Pflanzen und der Einrichtung ihres Wachsens gehandelt wird; als einer Einleitung zur Vollständigen Abhandlung von Wäldern und Hölzern nebst einer Abhandlung über den Nutzen der Botanischen Lehr=Arten; Und einer Erklärung derer in dieser Wissenschaft, und bey den Forst=Wesen gebräuchlichen Kunst=Wörter. Erster Theil.* (Nürnberg, 1764), preface, s. p.

tion of the newly defined field of natural history in the ongoing process of establishment and differentiation among the sciences.

In addition to the "classical" strain of natural history, a number of quite independent, popularizing works addressed an academic public not primarily interested in the internal discussions of naturalists as well as the educated lay. In the German territories this public also encompassed the future cameralists. In their curriculum, an economically oriented botany and zoology – best described as praxeology of natural history – were of particular importance.[62] Textbooks provided an introduction to natural history with special emphasis on its practical relevance.[63] A second category of such texts were the so-called "gemeinnützige" – commonly useful – works on natural history,[64] published in great numbers in the last decades of the eighteenth century, and a third was articles in review journals and other kinds of periodicals. According to these authors, only the knowledge they presented would enable the cameralist to discern harmful animals from useful ones and to identify economic uses of the flora and fauna. This all-embracing as well as optimized employment of natural resources should, in the end, guarantee the common weal for all future times. How was this aim of natural history conveyed in the above-mentioned texts, which encouraged the cameralist "to get to know the nature, effect, and use of substances which by the labors of the productive class contribute to the well-being of mankind"?[65]

Natural history publications in the eighteenth century in general were dominated by the above-mentioned concept of *oeconomia naturae*, which had first become more broadly disseminated in the context of seventeenth- and eighteenth-century physico-theological writing.[66] Whereas its application in physico-theological contexts was still reminiscent of the idea of all creatures being created equal by God, discourses on natural history not only claimed that natural resources were in principle inexhaustible, but that they should exclusively serve the benefit of mankind. Insofar as the branch of natural history devoted to practical utility employed the notion of *oeconomia naturae*, it seemingly con-

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[62] See Johann Georg Krünitz, *Oeconomisch-technologische Encyklopädie, oder allgemeines System der Staats-, Stadt-, Haus- und Landwirthschaft, und der Kunstgeschichte, in alphabetischer Ordnung*. Vol. 33 (Berlin, 1785); entry: Kammer=Wissenschaft, p. 483.

[63] See, for example, Johann Beckmann, *Anfangsgründe der Naturgeschichte* (Göttingen, 1767).

[64] See, for example, Georg Heinrich Borowski, *Gemeinnützige Naturgeschichte des Thierreichs, darinn die merkwürdigsten und nützlichsten Thiere in sistematischer Ordnung beschrieben, und alle Geschlechter in Abbildungen nach der Natur vorgestellet werden.* 10 vols. (Berlin and Stralsund, 1780-1798); Friedrich Samuel Bock, *Versuch einer wirthschaftlichen Naturgeschichte von dem Königreich Ost= und Westpreußen*. 5 vols. (Dessau, 1782-1785).

[65] "diejenigen Körper ihrer Natur, Würkkungsart und Gebrauche nach kennen(zulernen), die durch die Gewerbe der producierenden Klasse zur Glückseligkeit der Menschen das Ihre beitragen," Nau (cf. note 51), p. 3.

[66] See above note 29.

tradicted contemporary debates on threatening shortages of natural resources[67] – if God indeed guaranteed the inexhaustibility of natural resources, these problems could hardly be that urgent. Perhaps it was exactly this reassurance which explains the popularity of the notion of *oeconomia naturae* in eighteenth-century natural history. The contemporaries in any case did not see contradictions here, these two thought patterns rather complemented each other. Within the framework of the cameralistic concept of autarky, the comprehensive notion of the inexhaustibility of natural resources could peacefully coexist with the more broadly disseminated call towards an intensified employment of these resources and their supplementation with acclimatized foreign plants. In the works of Linnaeus, the coexistence of these two strains of thought is most easily discernible.[68] In any case, the practical relevance of natural products was conveyed to state administrators in a number of ways. Detailed descriptions of the technological and economic value of certain species of the flora and fauna should serve to train their perception of nature as a commodity as well as to propagate the cultivation of new kinds of plants and the breeding of new kinds of animals. In addition, tips were given on the optimal use of minerals, although these issues are found predominantly in journal articles or collections of essays encompassing a variety of topics.[69] In the following, the way the fauna were dealt with in cameralistic literature will be described in more detail.

The early modern period had no concept of "waste" as we understand it today;[70] almost every part of an animal found some kind of use. However, before the middle of the eighteenth century, this practice had not been systematically incorporated into the cameralistic curriculum. This might have been due to the fact that, initially, a cameralist's training focused on the practical administration of a nobleman's estate.[71] Only when, towards the middle of the century, the arts and crafts were increasingly taken into account, did their traditional

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[67] See Günter Bayerl, "Im Schatten der Nützlichkeit: Umweltprobleme im 18. Jahrhundert," Troitzsch (cf. note 9), pp.119-134, there pp. 130-132.

[68] See Koerner (cf. note 11), pp. 82-139.

[69] One example is a suggestion on how to market rocks: Schulze, "Vorschlag, wie ein Land seine harten Steine zu einem vortheilhaften Gewerbe anwenden könne," *Gemeinnützige Abhandlungen zur Beförderung der Erkenntniß und des Gebrauches natürlicher Dinge in Absicht auf die Wohlfahrt des Staates und des menschlichen Geschlechtes überhaupt*, Johann Daniel Titius (ed.), vol. 1 (Leipzig, 1768), pp. 143-147.

[70] See Ludolf Kuchenbuch, "Abfall. Eine stichwortgeschichtliche Erkundung," *Mensch und Umwelt in der Geschichte*, Jörg Calliess et. al. (eds.) (Pfaffenweiler, 1989), pp. 277-302; Reinhold Reith, "Abfall," Enyzklopädie der Neuzeit, vol. 1, (Stuttgart, 2005) (in press).

[71] See Johann Gottlieb Arndt, *Kurze Vorstellung, Wie die Vollkommenheit Der oeconomischen Wissenschafften Durch Physicalische | Mathematische | und Oeconomische Unterweisungen auf Schulen und Universitäten befördert | Und deren nützliche Anwendung Durch Einführung Wol=eingerichteter Oeconomie=Tabellen auf den Gütern, und den Gebrauch der Grund=Risse, ins Werck gesetellet werden könne....* (Zittau and Leipzig, 1728); Christoph Diethmar, *Einleitung in die öconomischen, Policey= und cameral=Wissenschaften. Nebst Verzeichnis eines zu solchen Wissenschaften dienlichen Büchervorraths* (Frankfurt/Oder, 1731).

utilization of animal by-products, for instance, gain a prominent position among the subjects relevant in a cameralist's training and practice.

For example, in his 'Useful Natural History of Germany', published in two volumes in 1791, Johann Matthäus Bechstein stated regarding horses: "Nobody will doubt that horses are very useful animals, which are useful for their services and their power as well as for various important products and parts of their bodies."[72] Such doubts were indeed not appropriate – even in everyday speech, the employment of horses for human affairs was immediately visible in their denominations, which allude to their different kinds of services.[73] Natural history texts, however, discussed the horse mostly as a "natural resource."[74] The products provided by the living horse were described in great detail: Its hair could be used for making bird snares, violin bows, neckbands, etc. It could also be used as saddlery stuffing, as a paintbrush bristle or rope material.[75] Concerning the intended exhaustive use, the authors also mentioned the importance of "hot horse manure" not only as a fertilizer, but also for the production of white lead. At the same time, it was remarked that the "Egyptians in the region of Cairo employed the soot of burned horse manure" for the production of ammonia.[76] Only at first sight does such a reference seem somewhat strange. From the 1760s onwards, it was not only debated whether ammonia, an important and costly auxiliary substance in the manufacture of dyes, could be produced in Germany to avoid the necessity of importing.[77] In Magdeburg corresponding experiments were carried out as well.[78] Notwithstanding the impor-

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[72] "Daß die Pferde sehr nützliche Thiere sind, die sowohl durch ihre Dienste und Kräfte, als auch durch verschiedene wichtige Produkte und Theile ihres Körpers nützen, zieht wohl niemand in Zweifel." Johann Matthäus Bechstein, *Gemeinnützige Naturgeschichte Deutschlands nach allen drey Reichen. Ein Handbuch zur deutlichern und vollständigern Selbstbelehrung besonders für Forstmänner, Jugendlehrer und Oekonomen.* Vol. 1 (Leipzig, 1791), p. 274, quoted in id., Leipzig 1801[2].

[73] See Johann Samuel Halle, *Die Naturgeschichte der Thiere in Sistematischer Ordnung.* 2 vols. (Berlin, 1757), vol. 1, p. 245.

[74] Günter Anders, *Die Antiquiertheit des Menschen.* Vol. II. *Über die Zerstörung des Lebens im Zeitalter der dritten industriellen Revolution* (Reprint Munich, 1995), p. 21.

[75] Bechstein (cf. note 73), p. 277. See also Friedrich Ludwig Walther, *Versuch eines Systems der Cameralwissenschaften. Dritter Theil. Technologie* (Giessen, 1796), p. 77.

[76] Bechstein (cf. note 73), p. 280. See also Friedrich Albrecht Anton Meyer, *Versuche einer vollständigen Naturgeschichte der Hausthiere, im Grundrisse* (Göttingen, 1792), p. 151.

[77] See Wilhelm Christoph Alberti, *Deutliche und gründliche Anleitung zur Salmiak=Fabrik welcher dem Egyptischen an Güte und Preise vollkommen ähnlich ist. Nebst einer vorläufigen kurzen Prüfung der dazu vorgeschlagenen Methoden und Materialien* (Berlin and Leipzig, 1780); Johann Heinrich Gottlob von Justi, *Gesammelte Chymische Schriften worinnen das Wesen der Metalle und die wichtigsten chymischen Arbeiten vor dem Nahrungsstand und das Bergwesen, ausführlich abgehandelt werden*, 2 vols. (Berlin and Leipzig, 1760/61), vol. 1, p. 236.

[78] See W.A. Klewiz, "Geschichte und Beschreibung der Salmiakfabrik in Magdeburg. Auch Etwas von der eingegangenen Vitriolsiederey," *Beyträge zur Ökonomie, Technologie, Policey= und Cameralwissenschaft*, Johann Beckmann (ed.), Part 9 (Göttingen, 1784), pp. 383-396.

tance of the products of the live horse sketched here, its real usefulness for the arts and crafts only began with its death. Its hide was important for the production of leather, its hooves were used in horn-turning, and its bladder was turned into tobacco pouches. Its teeth were employed in papermaking for smoothening sheets of paper, its crest oil was appreciated by shoemakers and tanners alike as a leather lubricant. Saddlers and organ builders, in turn, were interested in the horse tendons.[79] In texts dealing with these issues, domestic animals were not the only objects of investigation for their potential usefulness in the arts and crafts. Wild animals were taken into focus as well, in which case the texts also deviated to the suitable hunting techniques.[80] Among the wild animals, most attention was devoted to the vermin.

The traditional threat of pests and vermin to agriculture is already reflected in early eighteenth-century encyclopaedias.[81] Since the 1730/40s this issue had become a growing concern for state officials as well.[82] In the region of Brandenburg-Prussia, an attempt was made to systematically wipe them out. From the middle of the century, pests became a recurrent topic of discussion in a broad range of texts.[83] Towards the end of the century, insects that prey off woodlands attracted more attention. – In the light of the ongoing discussion of wood shortages and the formation of forestry science, this is hardly surprising.[84] In the investigation of pernicious animals from an economic point of

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[79] Bechstein (cf. note 73), p. 278. See Georg Christian Raff, *Naturgeschichte für Kinder zum Gebrauch auf Stat= und Landschulen* (Göttingen, 1781), p. 378.

[80] See Günter Bayerl and Torsten Meyer, "Glückseligkeit, Industrie und Natur – Wachstumsdenken im 18. Jahrhundert," *Umweltgeschichte. Methoden, Themen, Potentiale*, id. (eds.) (Cottbuser Studien zur Geschichte von Technik, Arbeit und Umwelt, no. 1) (Münster, etc., 1996), pp. 135-158, there p. 155.

[81] See, for example, Anonymous., *Allgemeines Lexicon Der Künste und Wissenschaften; Oder Kurtze Beschreibung des Reichs der Natur, der Himmel und himmlischen Cörper, der Luft, der Erden, samt denen bekannten Gewächsen, der Thiere, Steine und Ertze, des Meers und der darinn lebenden Geschöpffe ... In gehöriger Ordnung verfasset und mit Fleiß zusammen getragen von Einem Mitglied der Königl. Preuß. Societaet der Wissenschafften* (Leipzig, 1721), pp. 592, 884. Anonymous, *Compendieuses und Nutzbares Haußhaltungs=Lexicon, Worinnen Alle beym Feld= Acker= Garten= und Wein=Bau ... In Alphabetische Ordnung gebracht, und mit sonderbaren Fleiß zusammen getragen von einem Liebhaber der Oeconomischen Wissenschafften* (Chemnitz, 1728), pp. 305, 763, 1050.

[82] See Bernd Herrmann, "Die Entvölkerung der Landschaft. Der Kampf gegen "culturschädliche Thiere" in Brandenburg im 18. Jahrhundert," Die Veränderung der Kulturlandschaft. Nutzungen – Sichtweisen – Planungen, Günter Bayerl and Torsten Meyer (eds.), (Cottbuser Studien zur Geschichte von Technik, Arbeit und Umwelt, no. 22) (Münster, etc., 2003), pp. 33-59 and Jutta Nowosadko, "Die policierte Fauna in Theorie und Praxis. Frühneuzeitliche Tierhaltung, Seuchen- und Schädlingsbekämpfung im Spiegel der Policeyvorschriften," Policey und frehneuzeitliche Gesellschaft, Karl Härter (ed.) (Frankfurt/Main 2000), pp. 297-340.

[83] See Annette Fröhner, *Technologie und Enzyklopädismus im Übergang vom 18. zum 19. Jahrhundert: Johann Georg Krünitz (1728-1796) und seine Oeconomisch-technologische Encyklopädie* (Mannheim, 1994), p. 322.

[84] See Meyer (cf. note 41), p. 122; Torsten Meyer, "Von der begrenzten zur unbegrenzten Ausrottung: Schädlinge als natürliches Risiko im 18. Jahrhundert" (cf. note 83), pp. 61-73.

view, the efforts by Brandenburg-Prussia seemingly had a catalytic function, even though it does not seem that they were very successful in practice.[85] In any case, since the 1750/60s vermin were granted more space in natural history texts. Future officials were not only taught what economic damage these pests caused, they were also instructed on how to hunt them down and which handicrafts were interested in their corpses. This is exemplarily discussed in the following with the otter as seen through the lens of cameralism.

According to the authors of popularizing books on natural history, the otter was a "looter of fish ponds,"[86] and "very gluttonous (and) by nature savage, cruel, sly and snappy."[87] These negative attributes already legitimized its persecution. At the same time, because of the economic damage it caused, some German territories had granted otter-trapping rights not only to woodsmen and hunters in noble service but also to the owners of fish-ponds.[88] The latter were, however, obliged to hand in the pelts which, from a cameralistic point of view, were of extraordinary interest. Authors on natural history were less interested in teaching the cameralists that the otter was the natural enemy of the water rat. This does not come as a surprise, insofar as the peltmonger could use the otter's fur as a raw material for high-quality products and the hatter as a welcome substitute for rare beaver fur. This context also explains the laconic commentary by Georg Heinrich Borowski in his 'Useful Natural History of the Animal Kingdom': "One avoids shooting it (i.e. the otter), because its pelt will thus be damaged."[89] From the point of view of a practice-oriented natural history, only dead vermin were worth description – while alive, they jeopardized man's cultural achievements, in this case his fish-ponds.

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[85] See Herrmann (cf. note 83).

[86] "Verwüster der Fischteiche," Johann Samuel Halle, *Die Naturgeschichte der Thiere in Sistematischer Ordnung.* 2 vols. (Berlin, 1757), vol. 1, pp. 564-567, p. 565. See also Georg Heinrich Borowski, *Gemeinnützige Naturgeschichte des Thierreichs, darinn die merkwürdigsten und nützlichsten Thiere in sistematischer Ordnung beschrieben, und alle Geschlechter in Abbildungen nach der Natur vorgestellet werden. 10 vol.* (Berlin and Stralsund, 1780-1798), vol. 1, p. 65.

[87] "sehr gefräßig (und) seiner Natur nach wild, grausam, schlau und beißig," Borowski (cf. note 87), ibid.

[88] See Bechstein (cf. note 73), p. 835.

[89] "Man schießt ihn nicht gern, weil sein Balg dadurch versehrt wird." Borowski, (cf. note 87), ibid.

Commoditable nature in academic prize contests and periodicals

As part of contemporary cameralistic theory, the perception of nature as a commodity not only shaped academic teaching,[90] it also influenced the rapidly growing eighteenth-century profession of administration officials, reaching even broader groups of contemporary decision-makers as well. In the following, the institutional framework of these developments will be briefly sketched before we discuss in more detail how the perception of nature as a commodity appeared in the context of academic prize contests and periodicals.

Already in 1755, Justi had formulated a program for a communications offensive in his 'Essay on Measures to make Knowledge in the Economical and Cameral Sciences Quite Useful' (*Abhandlung von den Mitteln die Erkenntniß in den ökonomischen und Cameral=Wissenschaften recht nützlich zu machen*): Academies of science should obligate their members to conduct practice-oriented research, "just as in the academy in Paris a member is obliged to engage in experiments with dyes for the sake of the manufactures." Colleges (*Hohe Schulen*) should establish a faculty of economics, "private persons should tell the world about their insights," economic societies were to be founded following the English model. In the country, economic supervisors (*Oeconomie=Inspectores*) were to instruct "the farmer on new advantages of husbanddry," children should be given an „idea of economics" early in their schooling. Justi saw periodicals as of special importance: "Administrative journals (*Intelligenz=Blätter*) should only report on subjects concerning the economy, on trade, manufactures, agriculture, stock-breeding and the arts and crafts, but should not become embroiled in academic disputes."[91] In the following decades, these proposals did indeed become reality. All such initiatives could well be pursued within the framework of enlightened absolutism, as long as their protagonists did not come into conflict with the authorities. Proposals regarding the promotion of the common good only became problematic in cases that exceeded pure "technical" matters, implying political and social change as well. In the light of the debate on the economic advantage of having independently managing farmers, which emerged in the 1770s, the perception of nature as a commodity, with its focus on the supply of raw materials, and attempts for social and political reforms might well be understood as two sides of the same coin: both basically aimed at increasing the nation's agricultural productivity.

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[90] For a case study, see Keith Tribe, "Die Kameral-Hohe Schule zu Lautern und die Anfänge der ökonomischen Lehre in Heidelberg (1774-1822)," *Die Institutionalisierung der Nationalökonomie an deutschen Universitäten*, Norbert Waszek (ed.) (St. Katharinen, 1988), pp. 162-191.

[91] Quoted in *Göttingische Anzeigen von gelehrten Sachen* 1755, no. 95, pp. 881-882.

Attempts towards "practice-oriented reforms"[92] were supported to a large extent by a group of new institutions located "below" the level of the already established academies. The most important of these were patriotic and economic societies. In the second half of the eighteenth century, they were being founded all over Europe, often backed by the sovereign's funds.[93] These institutions united university members with medium- or high-level administrative officials, middle-class citizens, noble landowners, and clergymen. Their membership in the German territories around 1800 has been estimated at roughly 3,000. These members saw as their main task the reform of agriculture and the arts and crafts. In the local or regional context they became quite prolific as publishers of textbooks, pamphlets, contest announcements, and agricultural calendars;[94] and they also established experimental farms, pedagogic institutions and libraries, and collected data in the context of statistical and topographical projects.[95] Even though the "reading peasant" in the eighteenth century still remained the exception rather than the rule – the topos of addressing the "industrious farmer" was widely used nevertheless[96] – these efforts must in any

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[92] Winfried Müller, *Die Aufklärung* (Enzyklopädie Deutscher Geschichte, no.61) (Munich, 2002), p. 11.

[93] See Henry E. Lowood, *Patriotism, Profit, and the Promotion of Science in the German Enlightenment. The Economic and Scientific Societies 1760-1815* (New York and London, 1991), the contributions in *Deutsche patriotische und gemeinnützige Gesellschaften*, Rudolf Vierhaus (ed.) (Munich, 1980), and Rudolf Schlögl, "Die patriotisch-gemeinnützigen Gesellschaften: Organisation, Sozialstruktur, Tätigkeitsfelder," *Aufklärungsgesellschaften*, Helmut Reinalter (ed.) (Frankfurt/Main, etc., 1993), pp. 61-81. For a well-researched case study see Helga Eichler, "Die Leipziger Ökonomische Sozietät im 18. Jahrhundert," *Jahrbuch für Geschichte des Feudalismus* 2(1978), pp. 357-386; Andreas Schöne "Die Leipziger Ökonomische Sozietät," *Sächsische Aufklärung*, Annelise Klingenberg et al. (eds.) (Leipzig, 2001), pp. 73-91. On the European context see, for example, Derek Hudson and Kenneth W. Luckhurst, *The Royal Society of Arts 1754-1954* (London, 1954), pp. 57-100, and Gilles Denis, "Du physicien agriculteur du dix-huitième à l'agronome des dix-neuvième et vingtième siècles: Mise en planche d'un champ de recherche et d'enseignement," *Comptes rendues de l'Académie d'agriculture de France* 87 (2001), 4, pp. 81-103, there pp. 85-86.

[94] See Hans Erich Bödeker, "Medien der patriotischen Gesellschaften," *Von Almanach bis Zeitung. Ein Handbuch der Medien in Deutschland 1700-1800*, Ernst Fischer, Wilhelm Haefs and York-Gothart Mix (eds.), (München, 1999), pp. 285-302. For a case study see Ludwig Hammermayer "Zur Publizistik von Aufklärung, Reform und Sozietätsbewegung in Bayern. Die Burghausener Sittlich-Ökonomische Gesellschaft und ihr 'Baierisch-Ökonomischer Hausvater' (1779-1786)" *Zeitschrift für bayerische Landesgeschichte* 58 (1995), pp. 341-401.

[95] See Norbert Schindler and Wolfgang Bonss, "Praktische Aufklärung – Ökonomische Sozietäten in Süddeutschland und Österreich im 18. Jahrhundert," Vierhaus (cf. note 94), pp. 255-353, there p. 275 and especially Wilfried Willer, "Die Bibliothek der churpfälzisch physikalisch-ökonomischen Gesellschaft (1770-1804)," *Bibliothek und Wissenschaft* 4(1967), pp. 240-302.

[96] *Nützliche Sammlungen vom Jahre 1755* (Hannover 1756), p. 243.

case have reached the majority of the decision-makers of the contemporary economy.[97]

The contribution of these institutions to a rise in agricultural productivity in the German territories in the second half of the eighteenth century has thus far been evaluated rather skeptically. According to Christoph Dipper, impulses for change in the economic practice of farmers rather resulted from their access to new markets. According to him, the educated landowners and clergymen that the agricultural literature reached did not have the power to cause a measurable effect on the economy.[98] Norbert Schindler and Wolfgang Bonss, to the contrary, see the historical relevance of the economic societies primarily on a different level:

> "A more positive evaluation, however, results from understanding these societies not as a means to turn technological innovations directly into practice, but as institutions concerned with the handling of these innovations: The historical achievement of these societies (...) was not so much the introduction of new crops, the application of technical devices or the promotion of trade and manufacturing – from a social historian's point of view, their decisive function was the education, training and perpetuation of new structures of action and interaction which allowed a means-end orientation toward internal as well as external nature."[99]

It is in this context that the relevance of the establishment of the perception of nature as a commodity becomes most clearly visible.

Academic prize contests and journal articles sought broad distribution of proposals on the expanded use of nature's resources. Prize contests were common in the eighteenth century all over Europe, often taking up economic issues.[100] Such submissions were organized by nearly all the academies, and the

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[97] Reinhard Wittmann, "Der lesende Landmann. Zur Rezeption aufklärerischer Bemühungen durch die bäuerliche Bevölkerung im 18. Jahrhundert," *Der Bauer Mittel- und Osteuropas im sozio-ökonomischen Wandel des 18. und 19. Jahrhunderts. Beitrag zu seiner Lage und deren Widerspiegelung in der zeitgenössischen Publizistik und Literatur*, Dan Berindei, Wolfgang Gesemann, Alfred Hoffmann, et al. (eds.) (Cologne and Vienna, 1973), pp. 142-196. For the *Bemerkungen der kuhrpfälzischen physikalisch-ökonomischen Gesellschaft*, a subscription list from 1774 contained 359 names—apart from booksellers serving as middlemen, they were chiefly court officials, see Christel Hess, *Presse und Publizistik in der Kurpfalz in der zweiten Hälfte des 18. Jahrhunderts* (Frankfurt/Main, Bern and New York, 1987), p. 61.

[98] See Dipper (cf. note 33), pp. 136-140

[99] Schindler and Bonss (cf. note 96), p. 256; for a similar evaluation Bödeker, see (cf. note 95), p. 301: "The patriotic societies clearly had a catalytic effect on economical progress, social change and contemporary changes in mentality." ("Die patriotischen Gesellschaften hatten zweifellos Katalysatorfunktion für den ökonomischen Fortschritt, den sozialen Wandel und die zeitgenössischen Veränderungen von Mentalitäten.").

[100] See Hans-Heinrich Müller, *Akademie und Wirtschaft im 18. Jahrhundert. Agrarökonomische Preisaufgaben und Preisschriften der Preußischen Akademie der Wissenschaften (Versuch, Tendenzen und Überblick)* (Berlin-Ost, 1975); *Ökonomisch Denken. Zum Ökonomieverständnis des 18. Jahrhunderts. Sozietäten – Preisfragen – Argumente*, Cornelia Buschmann and Karl Hildebrandt (eds.) (Cottbuser Studien zur Geschichte von Technik,

economic societies made use of this instrument as well. Prize contests tried to narrow the gap between theory and practice insofar as the submitting institutions hoped by means of the rewards offered to bring to light the knowledge of individuals who usually did not make their experiences public. Preferably, those contributions were to be rewarded that had already proven their practicability.[101] These aims can be discerned, for example, in the prize contest submitted by the Göttingen academy of science for November 1776: "Which plants are still growing wild in the territory of Hannover that might be used, especially by the farmer, with considerable advantage without neglecting his other business and for that reason are deemed worthy of being made known to him?"[102] The Göttingen academy was an especially active initiator of such economic prize contests and their range of subjects is revealed in a survey of the period between 1757 and 1761. The prize questions included the advantages of Swedish iron over that of German origin; a pigment made of dyer's-weed that would resemble indigo; recipes for preservable potato flour and bread; methods of achieving better soil fertility and savings on fertilizer by soaking grain; ways to increase the quality of German wool to that of Spanish or at least of English origin; about the nature and means of evading grain rust; for a fireproof wood-paint; for a comparison of German and English field divisions, and for the most favorable way to strip bark from living trees.[103] The intention of these prize contests in 1803 was clearly summarized in a submission of the Bavarian academy of sciences: "Which goods of nature can be found in Bavaria and the Upper Palatinate … which deserve more attention than it has been devoted to them so far? And which of these products would be suited to engage many hands in manufactures for their modification and perfection? The academy wishes that a theoretically underpinned procedure be disclosed by means of which these materials must be worked so that the artifacts in the end might be sold not only in our home country, but abroad as well."[104]

Arbeit und Umwelt) (Münster, etc., in press); the project "Preisfragen als Institution der Wissenschaftsgeschichte im Europa der Aufklärung" at the Forschungszentrum Europäische Aufklärung, Potsdam, is currently compiling an extensive database on eighteenth-century European prize contests.

[101] Müller (cf. note 101), p. 80.

[102] "Was für Gewächse wachsen noch im Hannöverischen wild, welche, besonders von dem Landmann, ohne Verabsäumung seiner übrigen Geschäfte, mit erheblichem Vortheile genutzet werden könten und deswegen ihm bekant gemacht zu werden verdienten." *Göttingische Anzeigen von gelehrten Sachen* 1776, no. 138, p. 1179.

[103] *Göttingische Anzeigen von gelehrten Sachen* 1756, no. 141, pp. 1275-1276, see for a list of prize contests of the Leipzig economic society 1764-1789 Eichler (cf. note 94), pp. 381-386.

[104] "Was sind in Bayern und der oberen Pfalz ... für Naturprodukte vorhanden, welche eine größere Aufmerksamkeit verdienten, als denselben bisher geschenkt worden ist? Und welche von diesen Produkten wären dazu geeignet, um mit der Bearbeitung und Vervollkommnung derselben mehrere Menschenhände fabrikmäßig beschäftigen zu können? Zugleich wünscht aber auch die Akademie, daß die theoretisch begründete Verfahrensart angegeben

The way this prize contest was formulated reveals the broad perspective, ranging from procural of the raw material through the finishing process to the export potential of the goods produced. Such was the systematic attempt in the period around 1800 to improve territorial welfare.

The discourse on the *Ökonomisierung der Natur* gained special relevance through its dissemination in the growing periodical market of the eighteenth century.[105] The print runs of these publications were between 300 and, in some cases, over 1000 copies.[106] Eighteenth-century journals have recently been identified as an important medium for a "commonly useful economic enlightenment," which "decisively influenced the character of the German Enlightenment as a whole."[107] In this context, options for a qualitative and quantitative rise in agricultural productivity became a common issue of the so-called Intelligenzblätter and other journals that provided regional markets with general information.[108] The *Göttingischen Gelehrten Anzeigen*, in 1760, came to the conclusion that it was "in accordance with the present taste of different nations" that political journals treat economic issues as well.[109] Programmatic statements in this direction are found particularly in the founding or reissuance charters of such journals. A preface to the *Neues Hamburgisches Magazin*, which was published in 1766 as a sequel to the *Hamburgisches Magazin* thus explained: "The outline stays the same, but with increased attention to the practical sciences which might influence general and particular issues pertaining to the urban and the rural economy. To this end, the most important essays concerning the science of nature and its history, medicine and in any case all treatises and proposals concerning the common weal will provide us with plenty of material."[110] The new genre of journals covering subjects of commercial and artisanal practice finally represented an independent forum for these is-

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werde, wie selbe bearbeitet werden müssen, um ihnen als Kunstprodukten nicht bloß im In-, sondern auch im Auslande Absatz zu verschaffen." Quoted in Müller (cf. note 101), p. 76.

[105] See, for example, *Almanach bis Zeitung* (cf. note 95), *Pressewesen der Aufklärung. Periodische Schriften im Alten Reich*, Sabine Doering-Manteuffel, Josef Mancal and Wolfgang Wüst (eds.) (Berlin, 2001).

[106] See *Almanach bis Zeitung* (cf. note 95), pp. 18-19.

[107] Holger Bönig, "Das Intelligenzblatt," *Almanach bis Zeitung* (cf. note 95), pp. 89-104, there p. 96.

[108] See, for example, Michael Rüdiger Gerber, *Die schlesischen Provinzialblätter 1785-1849* (Sigmaringen, 1995), pp. 108-110 and the list of articles on these issues pp. 363-419.

[109] "nach dem jetzt herrschenden Geschmacke der Nationen," *Göttingische Anzeigen von gelehrten Sachen* 1768, no. 16, p. 127.

[110] "Der Plan bleibet der alte, nur mit mehrerer Ausbreitung in Ansehung der praktischen Wissenschaften, welche einen nähern Einfluß in die allgemeine und besondere Stadt= und Land= Oekonomie haben. Hierzu werden uns die wichtigsten Artikel aus der Naturlehre und ihrer Geschichte, aus der Arzeney=Wissenschaft, und überhaupt aus allen gemeinnützigen Abhandlungen und Vorschlägen, den reichesten Stoff darbieten." *Neues Hamburgisches Magazin* 1767, Vorrede.

sues.[111] One reviewer in the *Göttingischen Gelehrten Anzeigen* described quite accurately in 1753 the central aim of the *Ökonomischen Nachrichten* of Leipzig: "to employ each of Nature's products in the most favorable way possible."[112]

In addition to the prize contests just mentioned and the journal contributions to be discussed below, there is a large body of independent publications, often written by members of patriotic and economic societies that also propagated the *Ökonomisierung der Natur*. These treatises, which cannot be dealt with here in detail, covered, for example, the cultivation of dyer's-weed as a substitute for imported indigo, proposals for re-cultivating the Lüneburger Heath, as well as sowing trees, irrigating meadows, growing mulberry trees for silkworm cultivation, growing potatoes, and producing, collecting and supplementing fertilizers. Treatises on "wood mathematics" (*Forstmathematik*) were especially frequent, to assist foresters, for example, in calculating the timber yield of a living tree. In view of the homogenous composition of these disseminating organs, as outlined above, it is hardly surprising that the perception of nature as a commodity appeared without considerable variation in these different kinds of texts. Well-known authors such as Johann Beckmann were not the only ones to propagate the efficient use of natural goods in cameralistic textbooks as well as in review journals and periodicals covering subjects of commercial and artisanal practice – Beckmann himself also sat on the jury for prize questions on economic issues sponsored by the Göttingen academy.

This new dimension of a broad dissemination of commoditable nature becomes especially apparent when contrasted against the limited ways in which such a utilitarian approach toward natural resources was communicated during the European expansion of the preceding two centuries. A quite similar approach can in fact be discerned – for example, there is documentation on attempts to explore and investigate foreign plants in the journal of Christopher Columbus.[113] Broad dissemination of such instructions is still absent, however. Apart from mentions in travel accounts, such issues were debated "in public" mostly in the early academies. As such measures were put into practice in the colonies, further dissemination at home in Europe of programmatic statements in that direction seemed neither useful, nor had the media by which they could

[111] See the bibliographies in Herbert Aagard, Günter Bayerl and Rolf-Jürgen Gleitsmann, "Die technologische Literatur des 18. Jahrhunderts als historische Quelle. Eine kommentierte Auswahl-Bibliographie," *Das achtzehnte Jahrhundert* 4 (1980), pp. 31-61; David A. Kronick, *Scientific and Technical Periodicals of the Seventeenth and Eighteenth Centuries: A Guide* (London, 1991).

[112] "jedes Product der Natur am höchsten und vorteilhaftesten zu nutzen," *Göttingische Anzeigen von gelehrten Sachen* 1759, no. 28, p. 256.

[113] See, for example, in the entry for 21 October 1492: "And then there are trees of a thousand kinds all producing their own kind of fruit, and all wonderfully aromatic; I am the saddest man in the world at not recognizing them, because I am certain that they are all of value, and I am bringing samples of them, and of the herbs." Christopher Columbus, *Journal of the first voyage (Diario del primer viaje) 1492*, B. W. Ife (ed.), (Warminster, 1990), p. 51.

have been widely propagated come into existence. Apart from the publication of individual travel accounts, which followed the model of a collecting and describing natural history, the insights of relevance for the arts and crafts gained in the early stages of European colonialism were first documented in the commercial literature (*Warenkunde*). In the eighteenth century the transfer of cultivated plants took on a new, systematic dimension most visible in the botanical gardens established for the study and acclimatization of unfamiliar varieties.[114] The broad range of texts sketched above – from cameralistic textbooks to journals covering subjects of economic and artisanal practice – opened up new possibilities for the dissemination of proposals to reform traditional economic practice in the home territory as well.

Useful proposals in eighteenth-century journals – the economical use of flora

Eighteenth-century authors of journal articles only rarely employed the notion of "nature" as such in promoting an intensified use of raw materials of vegetable, animal or mineral origin. A level of public discourse had evidently been reached at which higher production of raw materials was already presupposed as a desirable aim. Additional legitimations were apparently no longer necessary. Such traditional thought figures as the "imitation" or "perfection" of nature were at best mentioned in passing. The daily fare here was concrete proposals on how nature's goods could be exhaustively employed. Since the periodicals in which these proposals are usually to be found catered to a general audience, they are interspersed among miscellaneous other news items. Thematic sections were not the norm in such organs. Sometimes, articles of interest to us here can be easily identified if the journal concerned has a subject index in addition to the usual alphabetical index. The 'Useful Collections' (*Nützlichen Sammlungen*) from Hannover, founded in 1755, listed in such a subject index "economic essays" alongside theological, medical, moral, mathematical, physical, historical and geographical essays.

The journal contributions dealt with the current topics of the day of agrarian and artisanal reform. The acquisition of new arable land besides heath recovery such as marshland drainage, had been extensively practised in Prussia since the late seventeenth century. Much more space, however, was devoted to proposals for intensified use of already cleared land. Crop rotation and fertilizer use was as frequently discussed as irrigation. All this was inseparably mingled with stock-breeding tips, for example. Ideally, stall-feeding was supposed to free up

[114] See Norbert Ortmayr, "Kulturpflanzen: Transfers und Ausbreitungsprozesse im 18. Jahrhundert," *Vom Weltgeist beseelt. Globalgeschichte 1700-1815*, Margarete Grandner and Andrea Komlosy (eds.) (Vienna, 2004), pp. 73-99.

pastureland for tillage. This aim could only be reached if fodder was included in the crop rotation, replacing the traditional method of laying fields fallow. Clover fields provided the additional benefit of improving the soil quality with its nutritive nitrogen supplementation. Not least, stall-feeding enabled farmers to collect the manure systematically for dunging purposes – this context explains the rubric: "alphabetically arranged news of all kinds of manure, and their uses."[115] Other articles concerned the cultivation of meadows, apiculture, fishing, viticulture, brewing, horticulture, and forestry. As concerns the growing of commercial plants, countless experiments with surrogates for dyeing, tanning or paper-making were reported: the marsh lily was to be used to produce a yellow pigment, the root of tormentil for tanning, willows or nettles for the production of paper. Merino-sheep were recommended – as well as the floss of the poplarseed as a surrogate for cotton, or the schooling of mulberry trees for silkworm cultivation – in order to generate domestic sources of raw materials needed for high-quality textiles. Regarding the last example, in an effort to circumvent the finicky mulberry, one report discussed attempts to accustomize silkworms to ground ivy.[116] Reports on the qualities of foreign plants and their acclimatization potentials were frequent as well. In the single year 1771 the economic society of Leipzig published in its Anzeigen articles concerning "Siberian buckwheat," "Canadian cabbage," "sweet potatoes," the "East Indian olive, a "Siberian cress," and "Pennsylvanian" tobacco.[117]

As nearly all journals had a limited regional distribution, they did not confine themselves to original contributions. They saw themselves as multipliers of useful knowledge that had already been published elsewhere as well. Review journals exhibit this characteristic most clearly, of course. The most important among them was the 'Göttingen Notices on Learned Matters' (*Göttingischen Anzeigen von gelehrten Sachen*), published since 1753 by the Göttingen academy of sciences.[118] For our purposes, the *Göttingischen Anzeigen* is an excellent reference source for countless periodicals from the second half of the eighteenth century: Its editors were especially interested in agriculture and the arts and crafts and reviewed all kinds of literature concerning these issues extensively. Other journals also considered themselves distributors of the latest developments in these areas, adopting a European focus. The program of the

[115] "Alphabetische(n) Nachricht von allerley Arten von Mist, und deren Gebrauch." Review of an issue of the Leipzig *Ökonomische Nachrichten*, *Göttingische Zeitungen von gelehrten Sachen* 1750, no. 49, p. 390.

[116] *Göttingische Anzeigen von gelehrten Sachen* 1756, no. 15, p. 130.

[117] *Göttingische Anzeigen von gelehrten Sachen* 1771, no. 135, p. 1160.

[118] This was the sequel to the *Göttingische Zeitungen von gelehrten Sachen* which had been published since 1739. See, Joachim Ringleben, "Über die Anfänge der Göttingischen Gelehrten Anzeigen," *Die Wissenschaften in der Akademie*, Rudolf Smend and Hans-Heinrich Voigt (eds.) (Göttingen, 2002), pp. 345-355; Oskar Fambach, *Die Mitarbeiter der Göttingischen Gelehrten Anzeigen 1769-1836* (Tübingen, 1976), and Wolfgang Schimpf, *Die Rezensenten der Göttingischen Gelehrten Anzeigen 1760-1768* (Göttingen, 1982).

newly published *Hamburgisches Magazin* was described as follows: "They will inform us about all the nuggets contained in the publications of the academies of science. Everything contained in the publications of the learned societies for the investigation of nature, from the Baltic Sea to the Atlantic and the Mediterranean, hitherto unknown to Germans because of their scarcity and different tongues, will be eventually translated in this collection or reported in extract."[119]

"Utility," in this context, was naturally defined as productivity. A review of William Ellis' *Agriculture Improv'd* explained in 1745: "This book contains very much new information on all sorts of useful improvements in agriculture." One of the examples cited was: "Of a species of grass which grows to a height of five feet and can be cut four times a year."[120] Authors continually focused on such growth potential also in a figurative sense. There are frequent direct references to new potential sources of revenue, which testify to the growing capitalization of eighteenth-century agriculture, be it in terms of the individual landowner or the typical nationwide perspective of the cameralists. A review of a short treatise with the title 'The Utility of Importing Foreign Animals, Trees and Plants as Foodstuff and for Manufactures' reported in 1775: "A soil yielding one pound of rye is able to yield eighteen pounds of potatoes. One acre of 180 square *Ruten*, which yields rye worth three Reichsthaler, yields up to 10 Rthr. tobacco, and thereby improves the soil. With potatoes, the profit rises to eighteen Rthlr., and with mulberry trees, to thirty Rthlr."[121] On another occasion, the option of growing dyer's-weed as a surrogate for indigo was commented as follows: "The perfection of this invention would earn Germany millions a year, which it now, to the most part, must pay out in customs to

[119] "Sie werden uns die Schätze welche in den Schriften der Academien der Wissenschaften liegen bekand machen. Alles, was von der Ostsee an, bis an das atlantische und mittländtsche Meer in den Schriften der gelehrten Gesellschaften von der Naturforschung enthalten, und wegen seiner Seltenheit und der mancherlei Sprachen den Deutschen größtentheils unbekannt geblieben ist, nach und nach in der gegenwärtigen Sammlung übersetzen, oder in einem Auszuge mittheilen." *Göttingische Zeitungen von gelehrten Sachen* 1747, no. 26, pp. 204-205.

[120] "Es sind in diesem Werke sehr viele neue Nachrichten von allerhand nüzlichen Verbesserungen in dem Landbau enthalten." And: "Von einer Art Graß, das 5 Schuh hoch wächst, und viermahl im Jahr gemähet werden kan." *Göttingische Zeitungen von gelehrten Sachen* 1745, no. 103, p. 850.

[121] "Eben der Boden, der ein Pfund Roggen trägt, kan achtzehn Pfund Kartoffeln tragen. Ein Morgen von 180 Quadratruthen, der drey Reichsthaler wehrt an Roggen abwirft, trägt an Tabak bis 10 Rthr., und verbessert dabey das Erdreich. Mit den Kartoffeln steigt der Gewinnst auf achtzehn Rthlr., und beym Maulbeerenbaum auf dreyßig Rthlr." J. F. Thym, *Die Nutzbarkeit fremde Thiere, Bäume und Pflanzen zur Nahrung und Fabriken einzuführen* (Berlin, 1775), reviewed in *Göttingische Anzeigen von gelehrten Sachen* 1776, no. 12, p. 95.

France."[122] Praise for an English treatise on agriculture in 1770 was accordingly short and to the point: "This book is practical indeed. Its single aim is to draw out as much from a given estate as possible."[123]

Proposals for the exploitation of "waste" products illustrate well the attempt to make the utmost of domestic resources, with its associated "frugality."[124] Regions closer to towns were advised to consider using the tanner's waste (the bark of oak and other trees) as a fertilizer. The author remarked that these remainders were available in plenty in the towns whereas manure was scarcer there and thus more expensive than in the countryside. This could lead to a price advantage, without which this procedure was not considered reasonable, as the bark fertilizer would only improve the soil for one year. – The author added the suggestion that, depending on the quality of the local soil, other fertilizers be added to create the quality needed.[125] An essay in the Stuttgart *Selectis physico Oeconomicis* in 1750 somewhat surprisingly praised the "utility of tanner's bark for the growing of pineapples."[126] A more skeptical reviewer in 1759 reported on a very unusual recipe from the *Journal Oeconomique*: "One peculiar invention is to make a hearty broth out of moldy bread."[127] In other cases, the satisfaction at having found a way to make use of nature's products hitherto deemed harmful is more obvious: The *Physikalisch-ökonomische Abhandlungen* in 1767 reported on "a newly discovered use for the usually detested and in marshy regions very common sedge." With its solid root structure it was able to "stabilize even hillocks in a watery marsh, and could even become floating islands." Therefore it could be employed to "affix narrow causeways through marshes and, in this way, save a considerable amount of timber."[128] Other cases were more explicit about the focus implied here on exploiting the landscape to the fullest. An example is a tip in a Swiss journal from Bern considering the drainage of marshland: "For completely irreparable marshes there remains at least the hope of growing alders, floss-bearing

[122] "Die mehrere Vollkommenheit dieser Erfindung würde für Deutschland jährlich Millionen eintragen, die es izt mehrentheils an Frankreich zollen muß." *Göttingische Zeitungen von gelehrten Sachen* 1752, no. 40, p. 407.

[123] "Das Buch ist freilich practisch. Die ganze Absicht ist nämlich aus einem gegebenen Gute soviel zu ziehn als möglich ist." *Göttingische Anzeigen von gelehrten Sachen* 1771, no. 31, p. 257.

[124] See Reinhold Reith, "Recycling im späten Mittelalter und der frühen Neuzeit," *Frühneuzeit-Info* 14(2003), pp. 47-65; Donald Woodward, "'Swords into ploughshares': Recycling in pre-industrial England," *Economic History Review* 38 (1995), p. 175-191.

[125] *Nützliche Sammlungen vom Jahre 1755* (Hannover 1756), p. 243-246.

[126] *Göttingische Zeitungen von gelehrten Sachen* 1751, no. 64, p. 607.

[127] *Göttingische Anzeigen von gelehrten Sachen* 1759, no. 101, p. 878.

[128] "einem neu entdeckten Nutzen, der sonst verhaßten und in sumpfigen Gegenden so gemeinen Riedgräser"; "selbst im wäßrichten Sumpfe Hügel befestigen, auch zu schwimmenden Inseln werden"; and "zur Befestigung kleiner Dammwege über die Moräste anwenden, und dadurch vieles Holz ersparen." *Göttingische Anzeigen von gelehrten Sachen* 1768, no. 64, pp. 511-512.

grasses, and other such marshland plants."[129] Other treatises, according to the same reviewer, applauded "the planting of timber groves in all places that otherwise remained useless and empty."[130]

Ideally, new agricultural products should be grown on soils previously not considered suitable for agricultural production. Suggestions were made to plant the Lüneburger Heath with corn and tobacco on fallows. The sheer number of options, however, may well have left the contemporary reader somewhat at a loss about which of the countless projects ought best be realized. Even if the specific local soil and climate conditions could hardly be scientifically evaluated or aptly addressed in such periodicals, different possibilities were often weighed against each other. The yardstick was not just the general aim of increasing agricultural yield but also the intention to raise a landowner's revenues. The Leipzig *Ökonomischen Nachrichten* published in 1750 "a chart of an anonymous landlord to prove that even in Meissen [i.e. in Saxony] a vineyard was still more useful than a grain field (whereas, in Switzerland, the vineyard was even ten times the worth of a grain field)."[131]

In striking contrast to the thought figure of *oeconomia naturae* commonly evoked in the popular literature on natural history, the concrete proposals on local improvements sketched in the preceding paragraphs naturally admit certain limitations on soil use. Other cases also carefully evaluated if a particular area was more profitably used as woodland or for growing crops or fodder. The alternatives of gaining profit from transforming a hitherto unused space into a meadow or a carp pond were carefully compared as well.[132] This consciousness of limitations on soil fertility and hence man's use of natural goods in these texts was not interpreted in ethical or moral terms, however. It appeared as a given framework in which the most advantage was sought. Discourses with more general intentions, like those on the notion of *oeconomia naturae*, which abstracted from local circumstances, could apparently ignore such limitations. In the literature on natural history as well as in the context of eighteenth-century repopulation attempts, as a central factor of cameralistic theory and practice,[133] most authors presumed that there was always plenty unused land left. For example, by the application of additional labor the "abundance of marsh-

[129] "In ganz unverbesserlichen Sümpfen bleibt die Hoffnung übrig, Erlen, Flockengras und andere dergleichen Sumpfgewächse zu erzielen." *Göttingische Anzeigen von gelehrten Sachen* 1763, no. 61, p. 492.

[130] "insbesondere die Pflanzung des Holzes an allen sonst unnützlich leer bleibenden Plätzen," *Göttingische Anteigen von gelehrten Sachen* 1765, no. 77, p. 619.

[131] "Eines ungenannten Haußwirths Tabelle, zum Beweise, daß selbst in Meissen der Weinberg noch nützlicher als der Acker ist (wie er hingegen in der Schweiz wohl in zehenfachem Wehrt gegen den Acker steht)." *Göttingische Zeitungen von gelehrten Sachen* 1751, no. 51, p. 460.

[132] See *Göttingische Anzeigen von gelehrten Sachen* 1755, no. 60, p. 556.

[133] See Martin Fuhrmann, *Volksvermehrung als Staatsaufgabe? Bevölkerungs- und Ehepolitik in der deutschen politischen und ökonomischen Theorie des 18. und 19. Jahrhunderts* (Paderborn, etc., 2002).

land" in the German territories[134] could be cultivated productively and thus secure the future supply of necessary foodstuff.

Ways into practice

Journals covering subjects of commercial and artisanal practice were by definition oriented toward effectiveness and at least attempted to create direct interaction between theory and practice. Their editors had no doubt that the periodical medium was particularly suited to such intentions, even if they did not always express it in the straightforward style they expected of their authors: "Our own practice in the sciences has taught us that all assistance, amendments and encouragements of the mind, as well as all the ongoing projects concerning the knowledge of nature and economic applications might be promoted by works neither in folio nor in quarto, the perusal of which for daily economic needs is not possible for everyone for reasons of availability, time and expense, whereas shorter, carefully selected and examined writings and announcements offer to the thoughtful reader experience and the resulting utility, which is the seal of practicability."[135] This medium thus corresponded well to the characteristic aim of the Enlightenment of fusing scientific standards and practical utility and acting, so to speak, as a catalyst in the collection, evaluation and communication of information. In the preface to the first volume of the *Ökonomischen Nachrichten* (Leipzig, 1750) this is expressed as follows: "These comments are, or should be such truthsas stem in part from secure theoretical axioms of the science of nature, mathematics as well as from the fundamental theoretical principles of moral and sound reasoning; in part also from practical experience. Both these sources of economic truth always have to be most exactingly united, and he who wishes to draw from one, must also draw from the other, if he intends to quench his thirst properly and still leave some for others to drink as well."[136]

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[134] "Ueberfluß an Moor=Feldern," *Göttingische Anzeigen von gelehrten Sachen* 1757, no. 11, p. 105.

[135] "Eigene Erfahrungen in den etwanigen Wissenschaften, haben uns gelehret: daß alle Abhelfungen, Verbesserungen und Ermunterungen des menschlichen Verstandes, nebst allen Projekten im Fortgange zur Natur=Kenntniß und zum ökonomischen Gebrauche, nicht durch Folianten, noch Quartanten, als welche nicht ein jeder Gelegenheit, Zeit, noch Aufwand hat, in den täglichen Bedürfnissen der Oekonomie, zu lesen, wohl aber durch kleinere ausgesuchte und wohl geprüfte Schriften und Anzeigen, welche die Erfahrung und der daraus folgende Nutzen, das Siegel der Brauchbarkeit, einem nachdenkenden Leser giebet, können befördert werden." *Neues Hamburgisches Magazin* 1766, preamble.

[136] "Diese Anmerkungen sind, oder sollen doch solche Wahrheiten seyn, die theils von sichern in der Naturlehre, Mathematic auch wohl Moral und gesunden Vernunft gegründeten theoretischen Grundsätzen, theils aus praktischen Erfahrungen ihren Ursprung haben. Beyde diese Quellen ökonomischer Wahrheiten müssen jederzeit auf das genaueste mit einander vereiniget werden, und wer aus der einen schöpfen will, muß auch aus der anderen dazu

This practice-oriented attitude was even to be found in instructions soliciting authors of articles in journals covering subjects of commercial and artisanal practice. The necessity to develop a new style of writing concentrated on simplicity and comprehensibility is repeatedly stressed, so that transfers into practice not be impeded merely for lack of proper communication. The Leipzig *Ökonomischen Nachrichten* provided detailed instructions on a "good manner of economic writing" in the preface to its first volume in 1750. Contest announcements also emphasized that responses should be written in the vernacular, and that proof of one's erudition and scholarship was unnecessary. Of greatest importance was practical utility and concise description.[137] English periodicals were praised for communicating "the most pleasing and useful news and discoveries from all domains of science" while "omitting the extraneous and exordia, repetitions of the already familiar, and all old-fashioned glosses and puffed up learning."[138] Even individual pride was to be done away with. The decision not to publish failed experiments could obstruct progress by not preventing others from wasting their time making the same mistakes over again. On the subject of ploughing trials at different depths and at different sowing times, the *Göttingischen Gelehrten Anzeigen* remarked: "Mr. Möller conducted various trials, the reporting of which might be the more useful since they have failed."[139] Such experimentation was considered an indispensable step towards the desired improvements. As scientific methods for testing soil quality did not exist yet, only the test a farmer conducted on his own grounds could show whether a new method might be successfully put to practice.[140]

As already remarked, it is not possible within the bounds of this essay, to evaluate exactly to what extent the proposals discussed here were actually implemented. The broad dissemination of this kind of discourse, however, is evident. It can already be deduced from the diffusion of contemporary periodicals. In addition, we must keep in mind that "the Enlightenment too was essentially an oral culture."[141] In the context considered here, this is to say, that the activities of patriotic and economic societies did not stop at the writing of articles and the launching of prize contests. Economic issues were, of course, dealt with at the regular meetings as the topics of lectures and debates. Discussion networks might be reconstructible from the exchanges by letter among the

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giessen, wenn er sich den Durst recht löschen, und auch andern darvon zu trinken geben will."

[137] *Göttingische Anzeigen von gelehrten Sachen* 1756, no. 141, p. 1274.

[138] "angenehmsten und nützlichsten Nachrichten, und Entdeckungen aus allen Theilen der Wissenschaft"; and "Weglaßung des Unnöthigen, der Exordien, der Wiederhohlungen des Bekannten, und alles altväterischen Putzes und großen Kragens der Gelehrsamkeit," *Göttingische Anzeigen von gelehrten Sachen* 1758, no. 93, p. 881.

[139] "Der Hr. Möller hat verschiedene Versuche gemacht, deren Anzeige vielleicht eben um deswegen nützlicher ist, weil sie mislungen sind." *Göttingische Anzeigen von gelehrten Sachen* 1753, no. 35, p. 322.

[140] See Achilles (cf. note 10), p. 52.

[141] See Müller (cf. note 93), p. 25.

protagonists involved. An instructive example of this kind of interaction can be derived from a publication edited irregularly between 1794 and 1803 by the botanist Friedrich Kasimir Medicus. Since 1764 a member of the Palatinate's academy of science, Medicus devoted his publication entitled 'The False Acacia-Tree. On Simplifying Common Cultivation of this Unique Variety of Wood of Its Kind, along with Forestry Issues and Other Matters of Relevance,'[142] to a single species: the fast-growing robinia or bastard acacia, the cultivation of which was seen as a means to counter the problem of wood scarcity. This multivolume work of roughly 2500 pages incorporated 128 letters by 84 individuals from all over Germany, half of whom reported on their own trials of growing the robinia. Among these persons only 23 % were employed in forestry, 50 % were middle or upper-level officials, 12 % were clergymen; the rest were, among others, university professors and noble landowners. Examples like these offer insights into the discussion networks in which the *Ökonomisierung der Natur*, in the eighteenth century, became a self-evident perspective on nature's goods.

Conclusion

Our contribution has tried to show that an analysis of the historical process of the "verbalization" of the relationship between man and nature can yield new insights, especially when the description of such discourses also takes into account the historical circumstances in which they were formulated. As has been argued, the perception of nature as a commodity was an answer to severe supply shortages as well as a product of cameralistic economic theory. Its broad dissemination, on the other hand, was only possible in the context of contemporary academies and societies and the rapidly expanding journal culture of the second half of the eighteenth century. From a modern point of view, it has to be emphasized that commoditable nature predominantly focused on vegetable and animal materials which, during the eighteenth century, were still of crucial importance for the commercial arts. This discourse thus emerged in a situation, in which the chemical refinement of raw materials and the transition to a new energy basis for the economy – which today appear as decisive turning points in the economic exploitation of nature's goods – was not yet part of the agenda of most European territories. The call for intensified use of nature's products as a central element of the emerging process of industrialization was thus formulated in a historical context still clearly dominated by pre-industrial circumstances. In this context, the new quality of the commodification of na-

[142] *Unächter Acacien-Baum. Zur Ermunterung des allgemeinen Anbaues dieser in ihrer Art einzigen Holzart, nebst forstwissenschaftlichen, und andern hier einschlagenden Gegenständen*. See Hess (cf. note 97), pp. 73-81.

ture, as expressed in economic discourses, was not an emergence of new concepts or thought figures of "nature." As has been shown, its characteristic was rather the absence of complex, legitimizing concepts. The relevance of the subjugation of nature to economy hence rather arises from a broad dissemination of practice-oriented instructions for the efficient use of nature's riches, under the aegis of new kinds of institutions, which reached the main decision-makers in administration, agriculture, and handicrafts. A specific trait of the perception of nature as a commodity is, furthermore, its orientation toward the future, resulting from a looming scarcity of raw materials. What had been irretrievably lost was the central thought figure of the Renaissance, which had understood "progress" in the various realms rather as harking back to the idealized living conditions of antiquity. In the eighteenth century, the decision-makers turned their gaze strictly forward. In this respect, the argument of the *Ökonomisierung der Natur* in the eighteenth century, within the realm of environmental history, follows Reinhard Koselleck's more general identification of the eighteenth century as a "straddle period" (*Sattelzeit*), with the decades after 1750 marking a historical watershed between the early modern period and modern times.[143] Insofar as the commodification of nature became ubiquitous in the later development of industrialization, the "verbalization" of a utilitarian attitude towards nature in the second half of the eighteenth century marks, in our opinion, a decisive – and probably irreversible – turning point in the history of the environment.

How should this turning point be evaluated today? It seems that completely different conclusions might be drawn. On the one hand, it could be claimed that the emergence of the perception of nature as a commodity in the eighteenth century consolidated an exploitative attitude towards nature which later became codified in the industrialization process. On the other hand, it could just as well be claimed that the texts we investigated always reflected a consciousness of the natural limitations on economic growth. So the *Ökonomisierung der Natur* consistently contained elements of a sustainable administration of nature's wealth.

[143] Reinhard Koselleck, "Das achtzehnte Jahrhundert als Beginn der Neuzeit," *Epochenschwellen und Epochenbewusstsein*, id. (ed.) (Munich, 1987) (Poetik und Hermeneutik, no. 12), pp. 269-282.